MAR 3 1911

LIBRARY OF THE MAR 4 1911

TELEPHONE ENGINEER

Vol. V CHICAGO, MARCH, 1911 No. 3

In "Efficiency as a Basis for Operation and Wages," Mr. Harrington Emerson, who has never heard of Copper Clad, says:

"A proposition was made to the line officers of a large corporation to reduce expenses $2,000,000 per annum. Whatever the time required to accomplish this, every day's delay caused an irretrievable loss of $6,666; yet details that ought to have been decided in eight minutes were allowed to wait for eight months."

How much has your delay in adopting Copper Clad cost you?

Weld-Clad

Trade Mark

Duplex Metals Company

Main Office and Works:
CHESTER, PENNSYLVANIA

Singer Building
New York City

Monadnock Building
Chicago, Ill.

THE FRIENDLY TESTING BRIDGE

H. M. FRIENDLY, *Inventor*

A SHORTER method for testing and locating faults on telegraph and telephone lines, electrical conductors and in electrical apparatus than has heretofore been used.

Formulae and calculations eliminated.

A new arrangement of the coils has been adopted permitting unusual ratios.

Rheostat coils arranged in decade with sliding contacts.

The Bridge is compact, solid and substantial in construction.

Available also for Varley and Murray Loop Tests and for measurement of resistances as a Wheatstone Bridge.

¶ Special pamphlet describing the construction and theory of the Bridge sent on application

Manufacturers of Surveying Instruments
Physical Laboratory Apparatus
Resistance Boxes and Wheatstone Bridges
Standard Weights and Measures

MADE BY

W. & L. E. GURLEY, TROY, N. Y., U. S. A.

LICENSEES

Elapsed Time

is what you sell to the consumer of your **Toll Service.**

Do you **know** that you get pay for all the service you deliver?

Knowledge—accurate information—not your operator's guess of the **Elapsed Time** will enable you to collect for all **"excess minutes."**

The CALCULAGRAPH

records **Elapsed Time** in minutes and fractions of a minute. It also records the time-of-day, but that is of lesser importance.

Its use on your Toll Switchboards will increase your revenue and at the same time increase the efficiency of your operators.

LET US SEND YOU OUR BOOKLET—IT'S FREE

CALCULAGRAPH COMPANY

1456 Jewelers Building, :: New York City

MATTHEWS' TELAFAULT

Louisville, Ky., Dec. 24, 1910.

Messrs. W. N. Matthews & Bro., St. Louis:

Referring to your letter of Dec. 22, with reference to the Matthews' Telafault, which was shipped us August 4th, will beg to say we have tested out this instrument and find that it works perfectly satisfactorily. It gives us a great deal better service than any other wireless tester we have tried, for the reason that all the others, when operating on cable which is in trouble, interferes seriously with the service. We find that Matthews' Telafault does not interfere at all with the service of the telephones which are not entirely out when testing. Of course this is a great advantage.

Yours very truly,
CENTRAL HOME TEL. & TEL. CO.
(Signed) by L. C. Griffitts, Engineer

W. N. MATTHEWS & BRO.

Manufacturers of These Patented Specialties

Matthews' Guy Anchors, Matthews' Cable Clips, Matthews' Bridle Rings, Matthews' Cable Roller, Matthews' Cable Splicing Joints, Matthews' Polerector, and Matthews' Telafault

229 North Second Street, St. Louis, U. S. A.

Telephone Engineer

WITH WHICH IS CONSOLIDATED THE WESTERN TELEPHONE JOURNAL
ESTABLISHED 1902

Published Monthly by the

ELECTRICITY MAGAZINE CORPORATION
MONADNOCK BUILDING, CHICAGO
Long Distance Telephone: Harrison 3014

Ed J. Mock and Paul H. Woodruff, Editors
James B. Crippen, Associate Editor
Allen L. Haase, Advertising Representative

New York Office, 1433 Hartford Bldg., 41 Union Square
LAURENCE F. COOK, Eastern Representative
Telephone: Stuyvesant 1672

London Office: 86 Maiden Lane, Covent Garden
S. RENTELL & CO., Representatives

This publication is free and independent of all business or house connections or control. No telephone company, manufacturer or supply dealer, or their stockholders or representatives have any financial interest in TELEPHONE ENGINEER *or any voice in its management or policy.*

Table of Contents

Annual Banquet, National Independent Telephone Association ..... *Frontispiece*
Editorial 127-130
The Fourteenth Independent Convention 131-134
Who's Who in the Telephone Game 135-136
New York Commission Notes 136
State Utility Commissions. By William Dunton Kerr 137-140
Equipment of the Murphysboro Exchange. By Gifford Wheeling 141-142
Submarine Cables for Telephone Work. By Maj. W. A. J. O'Meara 143-145
Form of Telephone Appraisal Report. By J. C. Slippy 146-148
Effect of Proposed Canadian Reciprocity 148
The Telephone Scrap Book 149-152
The Telephone in Business Getting. By T. I. Jones 155-157
What One Woman Thinks. By Sarah Elizabeth Brown 153-155
Oklahoma Association Meets 157
Digest of Foreign Telephone Literature 158-160
Long Distance Telephony in America. By John J. Carty 161-163
Recent Telephone Patents. By David S. Hulfish 163-164
The New York-Denver Toll Line 164
Department of Railway Telephones 165-172
Of Interest to the Trade 173-183
- Exhibits at the Convention 173
- Matthews at the Convention 174
- An Efficient Insulation and Capacity Tester 175
- Automatic's New Supply Department 176
- Non-Multiple Toll Switchboards 177
- Where Clay Product is Made 178
- Improved Party Line Service 180
- Cable Trouble Testing 182

Brevities of the Business 184

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico, - - - Per year, $2.00 — Foreign countries within the Postal Union, - Per year, $3.00
Canada, - - - - - - - - - - Per year, 2.50 — Single Copy, - - - - - - - - - - - - .20

NOTICE TO ADVERTISERS

Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. Regular date of issue, the first day of each month. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisements cannot be shown in advance of publication.

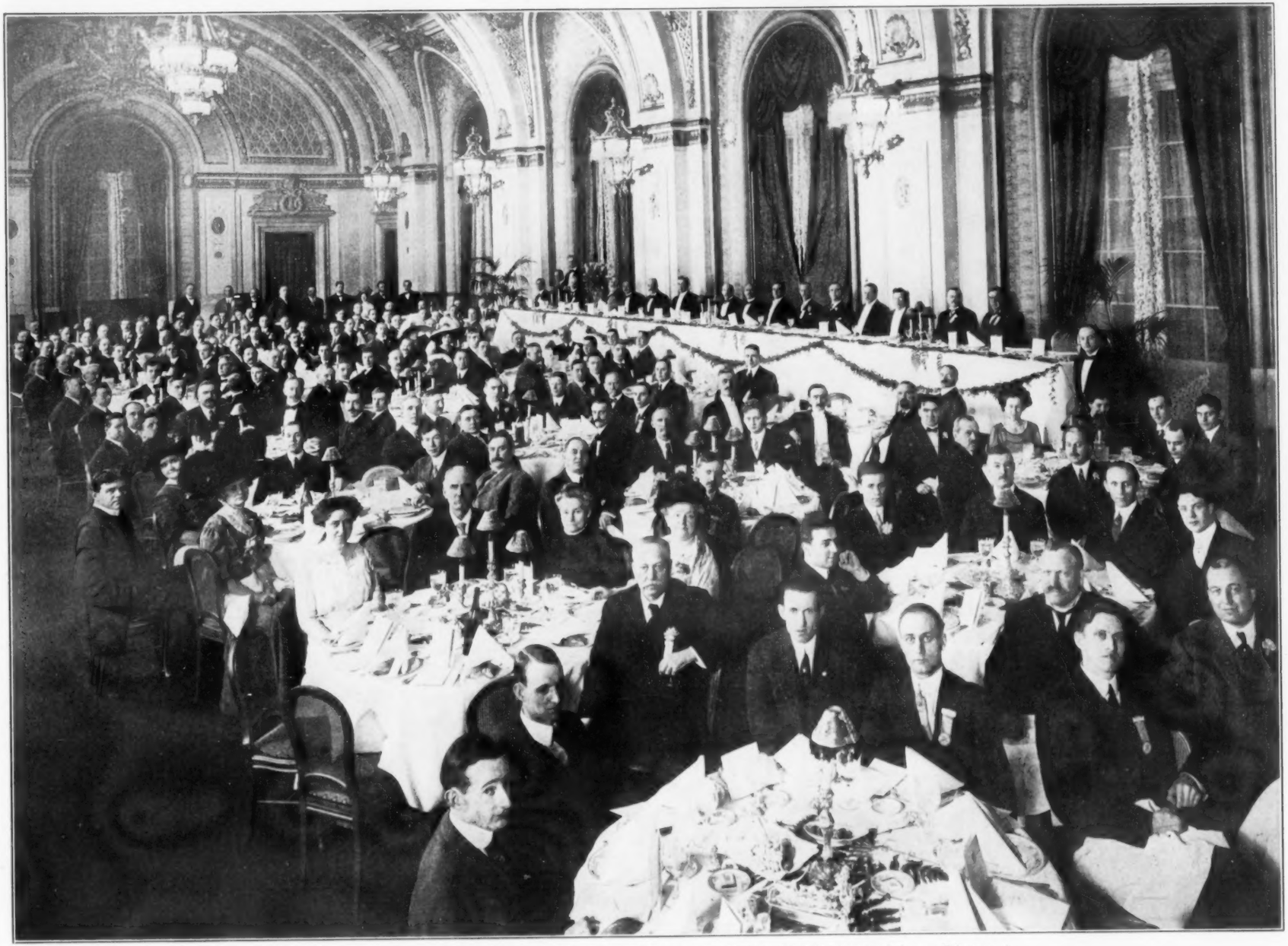
NOTICE TO SUBSCRIBERS

REMITTANCES—Remittances should be made by check, New York draft or money order, in favor of Telephone Engineer. Foreign subscriptions may be remitted direct by International Postal Money Order, or sent to our London office.

CHANGE OF ADDRESS—The old address should be given as well as the new, and notice should be received two weeks in advance of the desired change.

CLUB RATE—In acknowledgment of assistance rendered by subscribers in securing of new orders, a club rate of $1.50 per annum is quoted. This rate applies to new subscriptions in clubs of two or more.

Entered as second-class matter May 26, 1909, at the postoffice at Chicago, Illinois, under act of March 3, 1879.



The Annual Banquet of the National Independent Telephone Association, La Salle Hotel, Chicago, February 9.

Telephone Engineer

WITH WHICH IS CONSOLIDATED THE WESTERN TELEPHONE JOURNAL
ESTABLISHED 1902

VOL. V CHICAGO, MARCH, 1911 NO. 3

AFTER THE CONVENTION.

A CLEARING of the atmosphere has already become apparent following the fourteenth annual convention of the National Independent Telephone Association. Questions of policy being satisfactorily settled, the commercial side of the business is beginning to show signs of returning vigor. Manufacturers are reporting evidences of a tendency to break the bonds of ultra-conservatism that have hampered progress for the past year—a tendency toward expansion and new construction; the return to normal conditions of development.

It is but natural that the average independent operator, possessed by doubts as to his status in the field, made suspicious even of his confreres, should retreat into his shell for a time. It takes lots of nerve to order equipment for future development in the face of reports that your neighbors are selling out to the opposition, and that your state is about to dictate your rates and method of service. But the convention has made it clear that there is no organized plan to sell out, and that the state's tendency to regulate will be beneficial rather than otherwise.

The association has taken a decided stand, at least so far as resolutions go, and the bogie of a possible disruption of the party is banished. So many earnest delegates were present and in attendance at each session that each must have gone home with his faith in the business renewed and rejuvenated.

The association declared in favor of commission regulation and commission regulation means equitable rates, fair competition and a better market for securities. And these things, in turn, mean new business expansion and orders for equipment. So the outlook is rosy for operator and manufacturer alike.

In the matter of commission control the association does well to be forearmed; for that feature of public utility regulation is already with us, and it is hard to see how the companies affected could stop it, even if so inclined.

But it is obvious that a fairly and honestly operated public utility has nothing to lose and everything to gain by commission regulation. Such a commission, having power to establish and regulate rates, can assist many an independent company out of a serious predicament by giving its too low rates the boost that the company alone would have trouble in doing. Having the right to require physical connection, it can solve the present problems of service and policy. Having the power to prevent discrimination and unjust competition, it can protect the weaker company from the attacks of the stronger.

In short, the public service commission has passed beyond the doubtful stage. The only question now is not how, but by whom, shall we be regulated? It is largely a question of personalities, after all.

The resolution favoring commission control was the most important action of the convention—indeed, it was the only important action unless one so considers the resolution on independent integrity.

No official action was taken on the question of physical connection, in spite of President Wood's address and the splendid discourse of Theodore Gary.

But the main thing is that the political atmosphere was cleared, numerous doubts were set at rest, and the enthusiasm and virility of the independents were once more demonstrated.

MORE ON PHYSICAL CONNECTION.

NOW that the convention is over, the conviction cannot be avoided that the National Association neglected a splendid opportunity to go on record as officially indorsing the principle of physical connection of all lines. As President Frank H. Woods says, the public is about ready to insist upon universal interconnection, and the independents would gain an advantage by being the first to call for that relation.

That the convention did not officially take a stand upon this question of policy is the more to be regretted inasmuch as the sentiment of the association members was unquestionably all in its favor. Indeed, we have no hesitancy in making the unqualified assertion that had the question been put to a vote, the opponents of compulsory physical connection would have been overwhelmingly defeated.

Deeply as we regret it, we feel constrained to say that evident desire of some independents to avoid this subject smacks somewhat of hypocrisy. In this connection we will make another assertion. If a census were taken of all independent operating companies which already have Bell connections, the list would reach amazing proportions. This is one of the points the average association member has never felt called upon to discuss in meeting. Not that he is ashamed of it; he may talk your arm off about it as man to man. It is one of those freaks of psychology—the strange difference between the man individual and the man *en masse*.

The independents have fought the word *duplication* for these many years. Their slogan has been, and of course still is, telephone competition; and because competition *threatened* duplication an astounding amount of effort was devoted to compiling proof that there was no such thing. Directories of competing telephone companies were checked against each other, towns were canvassed, experts were quoted to prove that the percentage of telephone duplication in any community was inconsiderable.

Now the fact that there is any telephone duplication at all, even that ten or twelve per cent that the most ardent supporter of dual service will allow, is because the telephone itself is indispensable. The thoroughly up-to-date business house must have every possible means of communication, even if there were a dozen systems. Indeed, in the very smallness of the duplication figures

lies the danger to the future development of either company. A community with dual service reaches its saturation point sooner than with a single service, as has been amply proven. But even so, neither company has anything like the number of subscribers it should have; and furthermore, nearly all of either company's *prospects*, under these conditions, already use the competing service.

The company, then, to develop new business, must do one of two things. It must either install its instruments alongside of its competitor's; or it must induce its new patrons to discard the other service in its favor.

Against the chances for the success of the first method are arrayed those irrefutable figures, gathered with painstaking care, proving beyond the question of a doubt that the vast majority of telephone users do not and will not install two services.

Against the chances for the success of the second method are ranged the simplest and clearest of principles. "Possession is nine points of the law." And you cannot sell a man something he already has.

Granting that the two services are equally good, and that the rates are the same (for we gain nothing by contemplating a rate-cutting war) the result must be a deadlock.

Consider for a moment a hypothetical case. A city of 100,000 population would be considered very highly developed with 14,000 telephones. Indeed, this percentage of development is rarely reached with competition. Yet with dual service, under equitable conditions, each company is limited to about 7,000 subscribers—which is not a particularly high figure for the population. And please bear in mind that the *real* telephone development of that city of 100,000 is 7,000—not 14,000. So far as any one telephone user is concerned, there are only 7,000 telephones in the town, because that is all his service will reach. A simon pure fifty per cent efficiency proposition.

The community whose telephones number to saturation point, and yet which is served by two systems which do not connect, is not as well developed telephonically as the community with nine or ten per cent development with universal service.

We say again, competition will develop telephone saturation quicker than any other means. So let us have competition, by all means; but not the brand of competition that tries to make two customers out of one. That old axiom, "The telephone is a natural monopoly," has been much abused. The telephone itself is the monopoly, not the company operating it. Let us have one telephone, by all means; but not necessarily one company.

It seems almost strange that so simple a thing as inter-connection of competing lines should, as Mr. Woods says, fulfill every possible requirement that the public may demand for service.

He treats the question of physical connection from two standpoints, that of the public and that of the telephone companies. Six distinct advantages to the public present themselves.

1. It will give real universal service.
2. It will prevent division of the public into groups without communication, one with the other.
3. It will permit private branch exchanges with dual trunk line connection to give competition without duplication.
4. It enables the public to retain all of the advantages of competition.
5. It enables a subscriber to get cheaper service by patronizing the smaller system, and at the same time to reap the benefits of the universal system when he needs it by making payment for extra service only when used.
6. It gives each community the right to choose the kind of equipment and service it prefers and to be free to conduct its own telephone business.

And from the standpoint of the telephone company even a larger number of advantages are apparent. Here are some of them:

1. It makes every company part of the universal system.
2. It enables it to compete on an equal footing with the local exchange of the trust.
3. It removes all fear that it can be crushed out of existence, and thereby enables it to finance itself.
4. It removes all prejudices against the second system on account of duplication and the annoyance and expense of two telephones, thereby popularizing competition under new conditions.
5. It insures connections with long distance lines and neighboring exchanges.
6. It makes contracts with other companies unnecessary.
7. It adds commission regulation to insure a fair interchange of service and to prevent rate cutting, placing it in a position where it can defy the trust.
8. It removes none of the advantages now possessed. It means continued local ownership with all of its advantages, and that sooner or later the foreign competitor will be glad to retire from the local field, asking only in return that he be given a toll line connection.
9. It assures the companies that if they serve the public the commission will protect them against parasites.
10. It means added revenues to the local companies.
11. It will be the first step towards measured service, a sound system of charging for service rendered.

Mr. Woods and Mr. Gary have nearly exhausted the subject, and it is difficult to add anything to what we said editorially in October, 1909, and November, 1910, without repeating some of their arguments. One of the points brought out is particularly interesting, because it bears on the matter of rates.

The rule is that the residence station has a limited field of communication, largely local to its neighborhood. Look, for example, at the so-called "neighborhood service" of the Chicago Telephone Company. These neighborhood exchanges, although of course operated by the one company, have some of the operating characteristics of local independent exchanges, with interconnection arrangements. A low flat rate is made for unlimited calls in a certain restricted zone, while a toll or switching charge of five cents is made for connection with other exchanges. The service is popular and successful, because the switched calls are very few compared with the local calls, and the subscribers are willing to pay the extra five-cent toll occasionally in view of their unrestricted use of the local service.

It is an established fact that a large percentage of telephone calls originate and terminate in the same exchange. One company offering an universal service, ready to connect any subscriber with any other subscriber, must make its rates high enough to cover the cost of supplying such service—and we all know that the cost of furnishing service increases in greater ratio than the number of subscribers. "If the business of fur-

nishing telephonic communication could be so subdivided that cheap communication could be furnished only those whose needs are met with a smaller number of possible connections, with the privilege, upon the payment of a small fee, to reach any and every one else, there would be a telephone in every house."

We agree with Mr. Woods that such a condition is ideal, and that compulsory physical connection is a long step towards it. Indeed, under these conditions, each individual exchange might be operated by its own company, and give splendid service at very low rates.

Thus compulsory physical connection, so far from stifling competition, offers new opportunities for competition to an extent undreamed of by the former advocates of dual service.

In a word, compulsory physical connection is the panacea for practically all the present ills of telephone service. In closing we will call attention to the following model physical connection recommended by Mr. Woods:

A BILL FOR AN ACT requiring the connection of telephone lines and interchange of telephone service between telephone companies.

BE IT ENACTED by the legislature of the State of..... ..... *Section 1.* All telephone companies in this state shall, at all points where two or more central exchanges of different companies are maintained or operated in the same city, town, village or vicinity, connect their lines at such exchanges and interchange business, both locally and between all points within the State of ..... And where any telephone company maintains any private branch exchange of not less than ten instruments in any hotel or other place of business in any city, town, village or vicinity in which it and any other telephone company or companies maintain or operate central exchanges, and it is practical or reasonable so to do, the company so maintaining such private branch exchange shall, on the order of the State Railway Commission and the consent of the owner, proprietor or lessee of the premises wherein such private branch exchange is installed, connect or permit connection therewith of trunk lines of any other telephone company or companies operating a central exchange in the same city, town, village or vicinity. And where in any city, town or village there is only one telephone company operating a central exchange and doing a local exchange business, such company shall furnish and provide proper, suitable and necessary facilities for connecting and shall connect with its central exchange or exchanges all toll lines of any other telephone company or companies which shall be built to the boundary line of said city, town or village; and any telephone company extending its toll line or lines in or to or maintaining or operating any toll stations in any city, town or village, shall connect or permit connection of its toll line or lines with the central station or exchange of any other telephone company operating therein a central exchange or doing therein a local exchange business. No telephone company shall, however, be required to provide another telephone company with the service of its central or branch exchanges, lines, equipment, subscribers' stations and instruments, without reasonable and just compensation. Telephone companies having any such connection with any other telephone company or companies shall not discriminate in their tolls, charges or service against any such connecting company or any of its subscribers or patrons. Every telephone company shall receive and exchange business with and permit receipt and transmission of all messages between points in this state, by the patrons of local exchanges, over toll lines without discrimination between the different toll line companies connected with its exchange or exchanges, and shall, except only when it has its own toll line available for transmission of messages between its own subscribers, give the sender of toll line messages the right to select the route or line over which it shall be transmitted when more than one route for its transmission is available. In the absence of any agreement between such companies upon the terms and conditions of any connection for exchange of business herein provided, the State Railway Commission shall, upon the application or complaint of any company or person interested or concerned in the making or maintaining of any such connection and interchange of business, determine what terms and conditions are reasonable and just between the companies affected for the making and maintaining of such connection and interchange of business, including the proportionate cost to be borne by each company, and just and fair compensation to each company for the service of its exchange, or exchanges, lines, equipment, subscribers' stations and instruments, and any other matter or thing incident thereto and proper to be determined in connection therewith, and issue its order requiring said telephone companies to make and maintain such connection or connections of their lines and to interchange business in conformity therewith. Any telephone company failing or neglecting to comply with any such order of the State Railway Commission within the time prescribed for its taking effect, or making any discrimination in respect to tolls, charges or service that is by this act prohibited, shall upon conviction be fined in any sum not less than $250 nor more than $5,000. And any such order of said State Railway Commission may also be enforced in like manner as is or may be prescribed by law for enforcement of orders of the State Railway Commission against railroads and common carriers.

PROTECTION OF PROPERTY.

CRIMINAL court cases of recent date have succeeded in establishing a rather unfortunate reputation for alienists. The present epidemic of municipal regulation of public utility rates seems very apt to do the same thing for telephone experts. When one expert has shown that the company is losing money, another immediately proves it is making too much.

Just as mankind in general is divided into optimists and pessimists, so we must expect two kinds of experts: the one who is strong for the rights of property and favors the company on doubtful points, and the one who believes in benefitting the public, even at the expense of the company.

Were we of a pessimistic nature we might hint that the first mentioned variety of expert, he of the revision upward, has been accustomed to doing work for the companies, and receiving his compensation therefrom; while the downward revising expert sees an opportunity to build a reputation as a desirable aid to puzzled municipalities. Not being pessimistic, we mention these unworthy hypotheses merely to refute them. We believe the majority of those telephone men who have come to be known as experts are not only conscientious, but that in every decision they make they are moved by absolute conviction that they are right.

As a matter of hard logic, however, there is but one side to the question. Where any doubt exists—as doubt must exist in every telephone rate discussion until a scientific basis is established—the company must be given the benefit of the doubt. Given a choice, the public would rather contribute to a meager surplus for the company than to have the company, with a constantly increasing deficit, finally descend to inefficient service and final dissolution. Better that the taxpayers pay for a bridge twice as strong as need be, than that the whole structure collapse and leave them without any bridge.

It is not good practice to build or operate anything without a margin of safety. Even if a mathematically accurate basis for calculating telephone rates existed it might not be wise to cleave exactly to the line. But no such basis has yet been found, and to saddle the burden of the doubtful points onto the company is unfair and may be almost confiscatory.

Under proper regulation an obviously ample rate may be equalized by enforced improvements in the service. Below a certain, but poorly defined rate, satisfactory service is impossible.

The expert who makes revision downward his specialty will no doubt gain encomiums from inexpert public officials and the short-sighted public. But he may unwittingly be assisting in the wrecking of an efficient and well-managed property.

GETTING ON WITH THE BOSS.

IN the mutual criticism of fellow-workers, one hears a great deal of "pull," "drag," "stand-in," and other synonymous expressions of the day whenever one of their number gains promotion or other benefit. From the tones and expressions of the critics one infers that the process of advancing by favor is generally regarded as rather an underhanded means to an end.

Perhaps a majority of good, honest workers "see red," as the saying is, whenever they are brought into contact with their superiors. There is an antagonistic impulse, sometimes almost a desire to offend. And this feeling, far from being checked or overcome, is often encouraged. There is a sense of independence in it. "They can't rub it into me" is a common expression. And so they go on year after year, fighting their opportunities, deliberately rebuffing actual advances of the boss, proudly offering in explanation of their non-progress that they "never licked anybody's boots."

For those in whom this sentiment is rampant, it is a hard day when the realization comes that nine-tenths of all promotions are determined more or less by a personal factor.

Nowadays machines do a large part of our daily work. Some of them seem to do nearly everything but think. But for heads of departments we must have men; no mechanism has been discovered to take their place. And wherever men are in power, the human element naturally predominates.

Why is it considered that meeting one's boss in a friendly spirit is equivalent to crawling in the dust? The very thought is an admission of an inferiority which very likely does not exist. Bosses are usually human, and often possess large capacities for friendship without a thought of being sued for favor.

And so long as business management is human, certain social subtleties and an amount of business politics will have force in the progress of workers. Men are hired to do certain work; and that work they are likely to do for the rest of their days unless they "let the boss know they are living."

Work then, is not the only thing. This illustration is a case in point:

A certain concern employs many draftsmen. Draftsmen are peculiarly subject to layoffs; and the house in question sometimes let them go by the dozen. It is not a hit-or-miss proceeding, either; the unfortunates are carefully selected for the sacrifice. Now what type of men are they who get the blue slip? A certain number of loafers, of course; and a large percentage of "pluggers"—men who work all day, every day, with their noses to the tee-square, as the saying is. The men who stay year after year, and finally take charge of a department or are promoted out of it are workers, too; but they always find time for a cheery word or joke with the boss, or a short discussion of some interesting point in the work and its allied subjects. And, strange to say, these men are not at all sneaky, or small, or even over-ambitious. They are just whole-hearted, sociable fellows with a joy of life and an honest good-fellowship for anyone, even if he happens to be a boss. Some of the losers were good workers, and doubtless a perfect system would give them equal credit. But there you are again; boses are human, and see much more distinctly that which is brought to their notice. Most of us would get along so much better if we could forget that our bosses are our masters, and could remember that we are doing our work just as well as they are doing theirs, and that they never even dream of antagonizing us.

This thing of feeling walked upon is so illogical. How much more manly is the cheerful, sociable, but business-like worker—who makes everybody like him so well that they cannot consider his layoff for a moment—than the grumpy fellow who mutters, even while working his hardest, that they are "trying to rub it into him," and it makes him sick to see Bill and Jim hangin' around the boss all day. He's glad he ain't built that way.

Well, it is hard to change human nature, and those who follow impulse rather than logic would probably never advance very far anyway; which only goes to illustrate another chapter in the survival of the fittest.

MICHIGAN AD VALOREM TAX UPHELD.

WITH the filing of an opinion by Judge Denison, the state of Michigan is victorious in the suit brought by four telephone companies in their efforts to avoid paying the tax as imposed under act 49 of 1909 on an ad valorem basis. The decision is important to the telephone companies operating in Michigan and it means a difference in the tax under the old law and that imposed by the ad valorem law of $170,000 annually. Judge Denison holds that the law is constitutional and it places the telephone and telegraph companies in the same class with the railroads subject to the assessment as imposed by the state board of assessors. The judge in his opinion calls attention to the validity of the act affecting the railroad companies as upheld by Judge Wanty and sustained by the Supreme Court.

Suit was brought by the Citizens' Telephone Company of Grand Rapids, the Citizens' Telephone Company of Jackson, the Michigan State Telephone Company and the Union Telephone Company of Alma against the state to prevent the collection of the tax under the new law which provided "That the property of telephone and telegraph companies whose gross receipts within the state for the year ending June 30 do not exceed $500 shall be exempt from taxation."

Pursuant to the act the state board of assessors assessed the property of the complaining companies at $14,500,000 and levied thereon a tax of $300,000. The tax under the former law, which operated on a three per cent specific basis, would have been about $130,000, so that the new law effected $170,000 increase in taxes.

At the instigation of the telephone companies a preliminary injunction was granted and continued on condition that the companies pay the tax accruing under the old law so that only the excess would be affected by the injunction. With this conditon the companies complied. The complainants contested the state's right to operate under the new law on the grounds that it discriminated and took the property of the telephone companies without due process of law and also was a violation of the "equal protection" clause of the fourteenth amendment.

The Fourteenth Independent Convention

THE largest and most enthusiastic meeting ever held by the National Independent Telephone Association was its fourteenth annual convention at the La Salle Hotel, Chicago, February 8, 9 and 10. Numerically the attendance exceeded any previous convention of the association, registration showing that about 550 were present. The convention sessions were held in two large banquet halls on the nineteenth floor of the hotel, while the eighteenth and most of the seventeenth floors were occupied by the exhibits of supply and manufacturing companies.

That interesting feature of the convention, the technical conference, which has been so prominent in the past three meetings, did not receive the attention anticipated because of the critical questions of public policy which were so insistent at the time of the meeting.

President Frank H. Woods, Lincoln, Neb., opened the first session of the convention Wednesday morning. The association was welcomed to Chicago by Assistant Corporation Counsel H. W. Hayes of that city. Mr. Hayes called Chicago a telephone battleground, and referred to the development of the Illinois Telephone and Telegraph Company's system in that city. He stated his opinion that the new telephone system was destined to prove of great value to the city, and he spoke a good word for telephone competition. His address was responded to by Judge N. G. Hunter, from Wabash, Ind. Judge Hunter outlined the improvement in conditions which will result with the completion of the independent system in Chicago. He stated that independent telephony now represents about 4,000,000 stations and that all that was desired by the independent interests was an opportunity to conduct their business fairly and to meet their competition.

President Woods then delivered his annual address. He called attention to the fact that while Bell interests had originally ignored competition in the telephone field they had later attempted to stifle it. Competition is, however, still an important factor in telephone systems of this country and he thinks the Bell companies realize that they cannot control the field absolutely or hope to build a universal system that will be exclusively Bell. He pointed out that the Bell company no longer insists on exclusive use of Bell instruments in interconnection contracts. The telephone industry has developed from monopoly, he said, while most trusts and monopolies have grown from competition.

The subject of state commission control of public utilities was thoroughly covered by Mr. Woods. He regards that form of regulation as entirely efficient when a sufficient power rests in the hands of the commission. Twenty-two of the states have already established public utility commissions and others are expected to follow shortly. The recently established control of the Insterstate Commerce Commission over interstate telephone service will have a tendency to expand the functions of commission control. He recommends the creation of commissions in those states which are at present without such bodies. Their supervision places stock and bond issues of the companies on a reliable basis and settles questions of rates that would be difficult to adjust otherwise.

Mr. Woods then spoke at considerable length on the question of physical connection of telephone lines. He called attention to the fact that the independent telephone companies have always shown a willingness to accommodate the public and that interconnections between the independent systems for toll purposes were quite common. The public, however, demands such connections not only between independent lines, and between Bell lines, but between independent and Bell systems. He therefore advocates legislation compelling physical connection and urges that the independent companies appeal to their state commissions and legislatures for such laws. He mentioned the case of La Crosse, Wis., which has thirty-two private branch exchanges connected with both Bell and independent lines. The number of subscribers that can be reached over a telephone system alone determines its value, both for toll and local service. Compulsory inter-connection will permit local interests to dictate the kind of service to be given locally, whether manual or automatic, common battery or magneto. There are, he states, no legal reasons against physical connection of telephone lines.

The adoption of measured and limited service was advocated by Mr. Woods. In closing he again called attention to the advantage of commission control, mentioning the $350,000,000 now invested in independent telephone companies, an amount deserving recognition and protection.

The annual report of Secretary J. B. Ware mentioned a fund of $125,000 subscribed to help the independent cause and to meet the present crisis in the field. It is the intention of the association to raise this amount during the coming year. He remarked that the association possesses a card index which has listed 18,662 independent companies. Of these over five thousand are commercial companies, the rest being rural and farmers lines. He stated that in the central west the number of city telephones amount to ten per cent of the population, and attributed the increase of the use of residence telephones to the generally low independent rates. He even stated that the rates are frequently too low, for the cost of service has increased within the past few years. He compared the Bell rates in South Carolina and Georgia with those of the independent companies in Illinois and Indiana, and showed that the latter are considerably lower than the former. He mentioned the preparation of statistical tables on rates and other operating factors.

"How can Discrimination and Cut Rates be Prevented?" was the title of a paper read before the Thursday morning session of the convention by Manford Savage, from Champaign, Ill. He favors a fair public service commission whose function would be the supervision of all public utilities, provided the laws of the commission cover the subject perfectly. Existing laws on the statute books are already adequate in many cases to give equitable service to all public utility patrons. He considered that municipal commissions might give quicker action than state or federal bodies of that nature, and thought the commission form of government for cities promising from the telephonic viewpoint. It is necessary to prohibit ruinous competition as well as unfair combinations. Commissions should have power not only to prevent the abuse of

The National Independent Telephone Association in Executive Session, Annual Convention, La Salle Hotel, Chicago, February 8, 9 and 10.

public right, but to protect the rights of the company as well. The rate problem, he thought, would very likely be solved by the adoption of compulsory measured service on all local systems.

"Telephone Fire and Income Insurance" was the subject of a paper by James B. Hoge, from Cleveland, Ohio. Mr. Hoge explained the Fire Insurance Exchange and said that it was making a special study of telephone insurance. He pointed out that the fire hazard is diminished by the frequent inspection, and advocated eighty per cent of insurance to be carried on insurable telephone property. The feature of supplying emergency switchboards on short notice was also given some attention. The paper was discussed and the work of the insurance exchange praised by B. G. Hubbell, from Buffalo, Theodore Gary from Macon, Mo., and President F. H. Woods.

Executive session was called in the afternoon for discussing the conferences recently held between representatives of the A. T. & T. Company, J. P. Morgan & Company, and the leading independent operators. This discussion was wholly informal, its purpose being to relieve the minds of some of the independents of the idea that any consideration had been given to propositions for merging Bell and independent systems. It was made clear that the triangular conferences had been held for the purpose of trying to find a common ground for eliminating some of the wasteful features of the competition between Bell and independent interests. As the negotiations which formed the subject of the conferences had never been completed, nothing definite could be reported by those who had attended them.

Vice President E. B. Fisher, from Grand Rapids, took the chair for the final session of the convention Friday morning. Theodore Gary gave a long and well prepared address on "The Effects of Compulsory Connection on the Future of the Independent Telephone Companies." Mr. Gary is an earnest advocate of physical connection for all telephone systems, as has been urged by TELEPHONE ENGINEER since its inception. Indeed, Mr. Gary had prepared a paper on this subject as long ago as he was president of the association. This was suppressed by the advice of the association's board of directors. This was printed in the December number of TELEPHONE ENGINEER. Since it is our intention to publish Mr. Gary's paper in an early number, it will not be reviewed at this time.

The maintenance of an agent at Washington by independent companies was a point brought up by President Woods. He recalled the conference held with the Interstate Commerce Commission recently, and stated that the commission will make its policy public before carrying it into effect. It is now considering the extent of its jurisdiction, and meanwhile there is no obligation for the independent companies to maintain attorneys at Washington.

The legislative committee of the association reported through A. A. Godard a draft of a public utility law. The proposed law provided for the creation of public service commissions to regulate all public utilities. This tentative bill is mentioned elsewhere in this issue.

The committee on resolutions then reported through N. G. Hunter the following resolutions, which were adopted unanimously:

BE IT RESOLVED, that this Association recognizes the tendency toward the regulation and general control of all public utilities by commissions acting under authority of law, and we believe that the people have the right to protect themselves against injustice, oppression or inefficiency by reasonable and proper regulation of the duties, service and rates of such corporations:

Therefore we recommend to the state associations, and to the members of this Association, that they assist the legislatures of their respective states in the enactment of fair and reasonable public utilities legislation.

BE IT FURTHER RESOLVED, that this association desires to place itself upon record as emphatically demanding the regulation and control of all public service corporations by duly empowered commissions. In those states where no commissions now exist, we favor the creation of a body with full power to regulate, control and fix rates; in those states where commissions have been created, we favor the strengthening of the law so as to fully meet the conditions in the telephone business. We believe that such commissions should have the power to not only fix a maximum rate to be charged but also a minimum rate, to the end that competition be preserved against the reckless assaults of corporations that are able to recoup themselves elsewhere for the losses they sustain by reason of their destructive tactics where competition exists. We believe that such commissions should have the power to prevent preferences; to stop all discriminations as between individuals and as between communities; to fix and require the maintenance of standards of service; to order and to cause to be done those things that the public convenience and interest demand.

Whereas, certain ambiguities appear in the Interstate Commerce law as now written,

BE IT RESOLVED, that we demand of the Congress of the United States that such law be so amended as to vest the Interstate Commerce Commission with the same powers relative to interstate business as are herein recommended for such legislation.

Whereas, the press has recently published articles relative to the merging of the Bell and Independent telephone interests of this country and has repeatedly published articles to the effect that the National Independent Telephone Association, through its officers and directors, has been holding frequent conferences with the American (Bell) Telephone & Telegraph Company and J. P. Morgan & Company, looking to the merging of all Independent and Bell interests; and,

Whereas, such statements are unwarranted and without foundation in fact; and,

Whereas, according to the Constitution and By-Laws of the National Independent Telephone Association, the objects of the organization of this Association and the purposes of its perpetuity were solely, and are for the benefit of the strictly Independent operating companies of the country, and,

Whereas, this organization, the National Independent Telephone Association, has never had or outhorized anyone to have negotiations with the American Telephone & Telegraph Company or J. P. Morgan & Company, or any other representatives of a competitor, looking toward a merger with, or sale to, the Bell, Morgan or other competing interests; now, therefore,

BE IT RESOLVED, that the National Independent Telephone Association in convention assembled hereby reaffirms its adherence to the principles of independent telephony and avows its purposes to be the further development and the perpetuation of the integrity of the Independent telephone system as a whole.

In accordance with the report of the nominating committee a joint ballot resulted in the election of the following directors of the association for the ensuing year: Frank H. Woods, Lincoln, Neb.; E. B. Fisher, Grand Rapids, Mich.; B. G. Hubbell, Buffalo, N. Y.; H. D. Critchfield, Chicago, Ill.; S. E. Ward, Mansfield, Ohio; L. D. Kellogg, Chicago, Ill.; F. N. Kondolf, Rochester, N. Y.; Richard Valentine, Janesville, Wis.; E. H. Moulton, Minneapolis, Minn.; Theodore Gary, Macon, Mo.; Walter J. Uhl, Logansport, Ind.; Manford Savage, Champaign, Ill.; A. E. Boqua, Fort Smith, Ark.; J. C. Casler, Dallas, Tex.; E. D. Schade, Johnstown, Pa.; W. J. Melchers, Alma, Mich.; N. G. Hunter, Wabash, Ind. These directors will

appoint the officers of the association at a meeting early in March.

Amendments to the by-laws were made to allow small companies in states having no state association to vote in the national association. The convention was then adjourned.

THE TECHNICAL CONFERENCE.

The first of the technical conferences was held Wednesday afternoon, L. E. Hurtz, from Lincoln, Neb., being in the chair. A long and masterly paper was read by William Dunton Kerr of Chicago on the subject, "Public Relations of Telephone Companies." Mr. Kerr's paper will be published in TELEPHONE ENGINEER, its part I, on "State Utility Commissions" appearing in this issue. Mr. Kerr's paper was discussed thoroughly, and, indeed, excited a great deal of interest among the delegates. In the discussion Gansey R. Johnson, from Columbus, Ohio, mentioned the proposed commission bill now in the legislature of that state. In abstract this bill was printed in the last number of TELEPHONE ENGINEER. Mr. Johnston maintained that a mathematical cost basis could not be used in all cases in determining rates, as many factors must be considered that have no immediate relation to cost.

"Inspection of Telephone Wire," by Hugh T. Wreaks of the Wire Inspection Bureau, New York, was the next subject considered. An abstract of Mr. Wreak's paper will be given by us soon. In the discussion following its reading B. F. Wasson asked as to the best kind of iron wire for pole lines and drop wires. He stated that he had been having trouble with BB galvanized wire, which gave way after three or four years of service. In replying, Mr. Wreaks advocated a heavier galvanizing coat. Only a thin coat of galvanizing would stand the bending tests formerly given galvanized wire, but a heavier coat is perfectly permissible in practise, as sharp bending is not used in either line or drop wires.

The first paper read at the Thursday morning conference was "Construction Signal Rules," by B. F. Wasson, from Clinton, Ill. Mr. Wasson's subject was taken from his booklet on construction by the same title, and gives a code of signals by arm movements and whistles for the aid of linemen.

A question box revealed a great interest in the subject of phantom circuits. One-third of the total circuits of the Independent Telephone System of Lincoln, Neb., are of the phantom variety, according to George K. Gann. It was brought out that phantom circuits give more satisfactory results than physical circuits, although grounds on the physical circuits generally put the phantoms out of business. Cross talk is avoided by proper transposition, and the correct adjustment of relays does away with ringing troubles caused by inserting the phantom coils in the physical circuits. The longest phantom circuit in Lincoln's plant is eighty-five miles, but there is no reason why similar circuits 500 miles in length would not be successful. Mr. Hurtz pointed out that the value of phantom circuits is tremendous. The company which avoids using them is doing itself an injustice. In response to a question on maintenance expense per telephone, Mr. Glass from Pekin, Ill., gave the figure as between $6.50 and $7 in small exchanges to $9 for larger exchanges, including total operating expense without interest on investment. According to Mr. Brown, from Abilene, Kan., maintenance expense exclusively amounted to $2.02 per telephone, total operating expense coming to $8.30. About the average figure, without interest and taxes, seemed to be $8.50 for exchanges of approximately 1,000 subscribers. A brief discussion was held on methods of advertising toll business.

The Friday morning conference opened with a paper by A. J. Shands, from St. Louis, on "Private Branch Exchange Traffic." After a consideration of the growth of private branch exchange business and the best method of controlling this business, Mr. Shands' paper called attention to the trouble caused by inefficient operators, and advocated having the operators of private branch exchanges work under the control of the operating telephone company, rather than the subscriber who uses the board. An alternative would be to have the telephone company supervise the operators, calling upon them with instructions on improving the service from time to time.

"The Handling of Special and Emergency Long Distance Traffic," was the title of a paper by George K. Gann, from Lincoln, Neb. He considered the various classes into which special service may be divided. Election returns, baseball returns, etc., he has always found profitable in telephone handling. He also dwelt on the use of make-shift phantom circuits of composite telephone and telegraph working, or decreasing the number of circuits per operator to handle emergency service due to the storms, etc. In conclusion he again eulogized the phantom circuit, mentioning cases in which trouble on the physical circuits did not affect the phantom circuits at all.

The following papers, which were scheduled for a reading, were omitted through lack of time or absence of their authors: "Telephone By-Products," by R. H. Robinson, from Detroit, Mich.; "Securing of 30,000 Telephone Subscribers," by F. S. Williams, Chicago; "Specifications for Lead Covered Dry-Core Cable," by L. C. Griffith, Louisville, Ky.; "Modern Statistical Methods," by Charles E. Spencer, Chicago; and "Traffic Economies," by W. S. Vivian, Grand Rapids, Mich.

The annual banquet of the association was held Thursday evening in the large banquet hall of the La Salle hotel. It was well attended, and Manford Savage acted as a delightful toastmaster. B. G. Hubble, N. G. Hunter, H. C. Critchfield and Col. William L. Visscher were among the speakers.

Telephone Benefit Company Growing

The Telco Company, a corporation composed of officers and employes of the Colorado Telephone Company, is preparing to increase its capital stock from $24,000 to $50,000. The stockholders authorized the increase at a meeting this week, at which time they elected directors as follows: W. F. Brown, G. E. McCarn, E. B. Field, Jr., Roderick Reid and H. T. Vaile.

The stock is all held by telephone company officers and employes and the paid-in capital at the opening of the new year amounts to $23,749. The payments are largely made in the form of monthly dues of $5. The money is invested in ranch lands and town lots for the benefit of the stockholders, and an important feature is the loan benefits of the company. Employes, in the event of sickness or unusual conditions, can make loans from the company without the necessity of appealing to money sharks. Plans for broadening this feature of the work are being considered.

The organization has been in existence five years and has proven very beneficial for the stockholders from a number of standpoints. The directors will meet in a few days to organize and elect officers.

Who's Who in the Telephone Game

Facts and Fancies About a Man You Know or Ought to Know

GEORGE WASHINGTON and Abraham Lincoln got just a shade the worst of it on their birthday, when you think of the edge Frank Henry Woods got with his. If the really great have anything to do with their birthdays it would seem fitting that the short month of the year should be passed over lightly, or that Sundays or first and last days would be chosen. The calendar for February is pretty badly smeared up with red letter days as it is. But when we contemplate the possibility of other celebrities breaking in upon it the situation becomes strained, if not tragic. The birth of Frank Henry Woods was carefully planned with these conditions partially in mind, because he appears upon the scene early on the first day of February in 1868. He is unconsciously doing everything a man can to work another holiday into the brevity division of one of Time's shortest dimensions, for Frank Woods is one of our great telephone men—modestly so and unassumingly so. He has all of the outward and inward characteristics.

A Fighting Face Does Not Necessarily Mean That a Man Must Fight.

It was not possible for him to make a name for himself by crossing the Delaware, or by splitting rails or anything like that, because rail splitters were dwarfed in the bud on the prairies beyond the Missouri. And by waiting awhile the Platte river will go dry just to let you cross. It is Nebraska's most pretentious and obliging stream.

Being thus handicapped, Frank Henry exercised himself behind a bat on a baseball diamond. He got an early training in having things slammed into him and at times he gesticulated in a loud and uproarous way to have the action undelayed—the hotter the better! And, then, if the strong and vigorous shall come from the obscure and sequestered spots, what's the matter with Downer's Grove? It was there where Frank Woods wore skirts and curls—fancy it!

But the West does things for its boys and the Woods folks took their boys to Nebraska when they were quite small. It was there where they got their schooling and planted themselves among the substantial citizens of a hustling community in a husky commonwealth. Frank Henry "toiled upward in the night" for his, adding to the high school all that the Nebraska university had to offer, and that is more than considerable. He put on the finishing touches of his education at the Columbia University of New York. He was fitting himself for the law and he carried away his full share of honors wherever he went. A fighting face does not necessarily mean that a man must fight. But if he engages in the telephone business, it stands him well in hand, because it is certain that he will be obliged to do his share of fighting. Frank Woods is a telephone man, as has been said heretofore, but before he became a telephone man he was a lawyer, which has also been hinted at. As a lawyer he was long identified with the firm of Hall, Woods and Pound, practitioners in Lincoln.

It was prior to 1905 when Woods got peeved with the Bell telephone company. It doesn't require much of a stretch of the imagination to recall that he was not alone in this. For in various parts of the country other men were similarly afflicted at about the same time. We do not want to hold out the inference that Woods has lost his fighting qualifications, but when he was younger he fought somewhat harder. At the time we have named, Lincoln had the bummiest old magneto service that is imaginable—those old mills that ground hard or grounded, and when you got a connection somewhere your talk was cross-talk or telegraphic communication by induction. It was Lincoln—the city, not the man—that was famous for this condition. So Frank Woods got miffed one day when there was no Western Association game scheduled in his town and started the Lincoln Telephone and Telegraph Company.

He has been on the rampage ever since as the king-pin of action. His own big company ought to furnish enough things to do but it doesn't. He has been president of the Nebraska Independent Telephone Association most of the time; he is president and father of the Independent Telephone System of Nebraska—the acme of business schemes for independent operators; is president of the National Independent Telephone Association and has time to burn for various other civic and social clubs. It is proper

and fitting that this man's portrait and something of him appears at this time, because he has only recently gone through a most trying series of sessions with the alleged enemy and octopus of the telephone business. It looked for a while like men from all over the United States whose interests are in the Independent telephone business were coming to Chicago to get Woods' hide. Their sentiments had been built up upon rumors which carried ugly aspects, but were without serious foundations. The annual convention of the National Association, the largest gathering of telephone men ever assembled in this country, dismissed these prejudices and re-affirmed their confidence in their leader. This compliment has already been laid away in the archives of Mr. Woods' most cherished recollections.

No one has ever been able to discover when Mr. Woods gets his recreation. He must get it behind the steering wheel of his automobile as he whirls from one job to another. He got the baseball virus in his college days and as there has never been an antidote for that he has it yet. Most men take comfort in smoking, but Woods never formed that habit. Some gray hairs are beginning to fleck his temples, but nothing seems to dim the luster of his sharp eyes. He does not require glasses.

Mr. Frank Henry Woods married Miss Nellie Cochrane in 1897. His home is in a beautiful residential district of Lincoln, Nebraska, where with his wife and three sons he finds his greatest pleasures.

New York Commission Notes

The New York State Public Service Commission, Second District, has received a joint petition from the New York Telephone Company and the Clifton Park Telephone Company for the approval of the transfer of the plant of the Clifton Park Company to the New York Telephone Company. The Clifton Park Company operates in Jonesville, Saratoga county, and the territory immediately adjacent thereto. The company gives as a reason for its desire to transfer its plant to the New York Telephone Company that because of the New York Company operating generally in Saratoga county, the plant sought to be conveyed can be more advantageously and efficiently used in connection with the system of the New York Telephone Company. It is proposed to pay $4,365 for the property.

The commission has received a joint petition of the Ticonderoga Home Telephone Company and the Ticonderoga Telephone Company, asking for the approval of the transfer of a portion of the plant of the Ticonderoga Company to the Home Company. Both companies operate in the village of Ticonderoga, Essex county, and it is considered by both companies that the single system can be more advantageously and efficiently operated in that place. The Ticonderoga Home Company proposes to pay $9,200 for the apparatus of the Ticonderoga Company.

The commission made an order requiring the Black River Telephone Company to appear before the commission at Albany to show cause why its manager published in a circular issued to the residents of Adams, N. Y., announcing a schedule of rates, the statement: "We wish to announce to you that the following rates for telephone service will become effective on February 1, 1911, pursuant to an order of the Public Service Commission, Second District, Albany, N. Y."

The increased rates are higher than the rates provided for in the franchise granted by the village of Adams, Jefferson county, to the Black River Telephone Company, and the apparent intent of the circular was to cause patrons to believe that the increase put into effect was due to the direct order of the commission.

The company is also ordered to show cause why an order should not be made requiring the company to lower its rates in the village of Adams to the rates provided in the franchise under which it is operating in that village.

In various parts of the state, there have been increases in telephone rates of companies under the jurisdiction of the commission, and in many places the commission finds that minor officers of these companies have attempted to place the responsibility for increased rates upon the commission. The commission is determined that the public shall not be misled by any such statements, and for this reason has caused a public investigation in the Adams matter, where a printed circular had been issued and distributed to telephone patrons.

In no case has the commission ordered any company to increase its rates, and its sole efforts on the question of rates thus far have been directed to wipe out many discriminations existing in various parts of the state in which favored parties receive service at lower rates than their less fortunate neighbors were given for like service.

The commission has received five petitions from the New York Telephone Company in relation to the sales and mergers of the plants controlled by that company. A corporation has been formed known as the Allegany Telephone Company, located at Wellsville, to which it is proposed to sell the plant and property of the New York Telephone Company situated in Allegany county, including the rights and privileges granted to the New York and Pennsylvania Telephone and Telegraph Company, the predecessor of the New York Telephone Company, by the villages of Wellsville and Andover. The price to be paid is $35,000.

It is also proposed to sell the Amsterdam Automatic Telephone Company to the New York Telephone Company for $150,000.

The New York Telephone Company proposes also the merger of the Trumansburg Telephone Company, the stock of which is owned by the New York Telephone Company at present.

Application is also made for permission to merge the Jefferson County Telephone Company into the New York Telephone Company, the whole of the stock of the Jefferson County Company being owned by the New York Company at present.

The commission is asked to transfer the property, rights and franchises formerly belonging to the Central New York Telephone and Telegraph Company in the city of Oneonta, village of Unadilla, village of Richfield Springs, village of Laurens, village of Cooperstown and village of Walton, now owned by the New York Telephone Company, to the Otsego and Delaware Telephone Company for the sum of $98,000.

The petition states that at Amsterdam and Watertown, the majority of the subscribers of both of these companies have expressed their desire for the consolidation and unification of the systems. The company also alleges in its petitions that the transfer of the property in Allegany county, at Trumansburg and in Otsego and Delaware counties, permits it to be more advantageously and efficiently used and will prove of greater benefit to subscribers under the plan proposed by the company.

State Utility Commissions

By William Dunton Kerr*

TELEPHONE companies are public service agencies. In the services they furnish, in the rates which they charge and in the manner in which they conduct their business, the public at large has a vital interest. But telephone companies are no less desirous of furnishing a high quality of service, charging reasonable rates and conducting their affairs in an efficient and economical manner than is the public. Between the companies and the public there is a true community of interest. The relations between the public and the telephone companies should be harmonious and amicable in every respect.

William Dunton Kerr.

This is not always the case, however. Controversies have frequently arisen from mutual misapprehension of the demands and requirements of the respective parties. The effect of such controversies not being conducted in a spirit of fair play and mutual respect is to work instability in the public service, incite suspicion and ill will among the immediate beneficiaries of the service, and in every way to retard the progress and development of the public service enterprises. Both the utilities and the public suffer largely from the strained relations that exist under such circumstances.

Franchises passed by municipalities and accepted by telephone companies in the early days of the telephone industry have proved fruitful sources of controversy. In many cases rates were fixed at too low levels in the early franchises, as the subsequent wide and wholly unanticipated development of the service has demonstrated. The public benefits that have resulted form such franchises, however, are inestimable. As conditions have changed the public sometimes may have failed to meet the companies in fairness and declined to sanction adjustments which every consideration of justness and fairness prompted. In many cases, too, the boot may have been on the other foot. Telephone companies may have taken undue advantage of rights hastily granted to them and stubbornly refused to accede to the reasonable requirements of the public founded on changed circumstances and conditions surrounding the business.

Public and Utilities Desire Same Results.—In the end the companies and the public desire the same conditions to prevail in the business, namely, a high grade of service, reasonable and compensatory rates, and efficiency and economy in the operation of the service. As a rule neither the public nor the companies intend to be unfair or unreasonable. The logic of the situation requires that a means be devised to bring about and maintain an amicable and friendly understanding between the companies and the public. It is wholly unnecessary for bitter controversies to arise. Honest differences of opinion based on a true appreciation of the position of the other party are neither to be feared nor discouraged, but hostile demonstrations of passion and prejudice are much to be deprecated. Organized effort needs to be resorted to for the preservation of constructive and wholesome relations between the public and telephone companies. The manner of accomplishing this end is one of the highly important problems confronting alike the public and the telephone companies today.

STATE COMMISSIONS TO REPRESENT PUBLIC.

State Activity Desirable.—In promoting proper relations between the public and telephone utilities the interests of the public must be conserved by the state. The state represents the public in an unorganized capacity, and it is fitting that it should undertake in such capacity to supervise the public relations of telephone companies. The duty is fairly incumbent upon the state to do all in its power to effect proper and wholesome relations. The "let-alone" policy which characterized the early conduct of state governments is now recognized to have outlived its usefulness. The feeling is growing stronger all the time that it is proper and desirable for the state to undertake in a friendly and co-operative spirit the rectification of abuses that have developed in the public services and the direction of the services along the lines of the greatest utility in the future.

Functions of Commissions Co-operative.—Several states have appreciated their duty in this respect and have attempted with considerable success to afford a means for the amicable adjustment of the public relations of telephone and other public utilities. State railroad commissions have been in existence for a great many years. The Interstate Commerce Commission is almost a quarter of a century old. More recently state commissions have been given extended authority over public utilities other than carriers. Wisconsin, New York, Massachusetts, Maryland, Nebraska, Missouri, Oklahoma, Washington, North Dakota and other states have conferred on commissions of various kinds and varying degrees of power authority over gas, electric, water, telephone and other utilities, both privately and publicly owned and operated. This kind of activity on the part of the state is generally considered not only proper but necessary. States which have not already enacted public utility laws are con-

*Part I of a paper entitled "Public Relations of Telephone Companies," read at the Fourteenth Annual Convention of the National Independent Telephone Association. Copyright, 1911, by Wm. D. Kerr.

sidering the subject seriously, and it is probable that the near future will witness action. The state commissions has come to be a vital factor in the conduct of many public utility enterprises. Telephone companies have already been placed under the jurisdiction of the federal commission and in several states are answerable to state commissions for their services and rates. The statutes under which these commissions derive their authority are frequently styled regulating statutes, and the commissions themselves, regulating bodies. But their proper scope is not to regulate and control but to co-operate and assist the utilities to the end that the public rights represented by the state and the private rights of the proprietors of the enterprises be fully conserved. The duty of the commissions to the service companies subject to their jurisdiction is fully as strong as their duty to the public. The duties in the last analysis are one and the same; they are indistinguishable.

State-Wide Jurisdiction for Commissions.—Any co-operative undertaking of this character on the part of the state should be state-wide in its scope. Except in very rare instances the rate and service problems of telephone utilities are not confined to the smaller political subdivisions of the state. The service of many telephone companies extends over more than one state, but the state is the largest political division in this country outside of the federal government, whose powers are limited. The smaller political subdivisions of the state, such as town, city and county, are too restricted in territory to make them adequate for the handling of the problems of public relations. Telephone service is seldom confined in its scope to the territorial limits of particular cities, towns or counties. Exchange service is intra-community service, not intra-city service. Toll service is inter-community service. Business and social communities are no longer confined to single political subdivisions. The city forms a nucleus in and about which centers a larger community bound together by business and social ties and embracing numerous smaller cities and towns lying on the outskirts of the business and population center. Neither a city council nor a city commission drawing its authority from the state directly through the legislature or indirectly through the city council can be equipped adequately to adjust the relations between utility companies and the larger communities. What is true of telephone companies applies also to gas, water, electric and transportation services. The inter-community aspect of the telephone service has close parallels in the telegraph and transportation services.

REQUISITES OF STATE COMMISSION.

Development of State Telephone System.—A state commission, in order to satisfy the requirements of the public and the telephone companies, should have jurisdiction over all the telephone companies engaged in furnishing service in the state. The state should deal with the service performed by such companies as though it were a state service performed directly by the agents of the state. It should become the object and purpose of the commission to assist in the development of a great state telephone system holding out to all the people of the state the fullest possible facilities for the satisfaction of their telephone wants and needs. This is the attitude which should be uppermost in the minds of the framers of a telephone commission law. No effort should be spared to provide conditions under which the development of this state-wide system may proceed safely, securely and in friendly relations with all the people of the state. The state service need not be furnished by a single company. It is enough that all the companies in the state work together to the common end of providing state-wide service. Legislation might well be adopted conferring upon the commission authority in so far as possible to bring about in the public interest interchange of service in all cases.

Commissioners Honest and Able.—The personnel of the state commission is of the highest importance. The law should prescribe carefully the qualifications and training of the men who may be eligible for appointment. Appointees should be men of the highest integrity. They should be men whom no consideration of personal or other advantages could swerve from the path of duty. The integrity of the commissioners is perhaps of more importance than their ability. But they should be able men, as able as the responsibility of the positions may well justify. To this end the state should provide liberally for their compensation. There are few states in the union in which the public relations of telephone and other public service companies are not of sufficient importance to justify the payment of large salaries to public utility commissioners. The commission should be kept as free as possible from political influence.

Ample Funds Provided.—The commission should be provided with ample funds to procure the service of technical and professional experts. The problems of the public relations of telephone and other public utility companies are technical. It is desirable that the employees of the state having to deal with them should be among the best men available in their respective lines. First-class accountants and engineers are imperatively needed. Sufficient funds must be provided to enable the commission to engage all the clerical and other assistance needed to perform its purely administrative functions, and to collect, classify and co-ordinate statistical and other data relating to the industries. A commission should not be encouraged to spend money lavishly because funds are available, but it should not be compelled to make forced economies when opportunities for performing useful services present themselves. The state should deal liberally and bountifully with its commission.

Full Inquisitorial Powers.—The commission should have summary powers of investigation. To the extent that evils exist in the public services the most satisfactory cure for them is publicity. The commission should be in a position to require positive knowledge on any subject relating to service, rates and other public problems. It should be empowered and required to investigate fully any and every case of alleged abuse. The public is entitled to its speedy determination of the merits of controverted questions, and the utility company should insist that questions in dispute be settled by the commission with as little delay as possible upon the fullest possible inquiry into the facts and circumstances. The commission should not be bound by testimony laid before it. Findings of the commission, accompanied by full opinions, should be recorded in every case and published for the benefit of those immediately interested and the instruction of the public and those who may later experience similar problems and difficulties.

Commission Given Final Responsibility.—The commission should have full control over rates and serv-

ices. It should have the power and be required to fix and enforce individual rates and schedules of rates, establishing relations between different classes of patrons, and otherwise and in every way putting rates on sound business bases. It should be empowered, and required, to make all necessary service tests and to prescribe reasonable service standards to be observed under different conditions existing in the state. It must have the power, and be required, to make valuations of the physical and other properties of public utility companies used and useful for the convenience of the public; to prescribe reasonable depreciation standards, to require that depreciation accounts be set up and maintained whenever possible, and to make proper allowances for depreciation in adjusting rates; to institute uniform accounting and statistical practices, whereby the reasonableness of rates may be determined and efficiency and economy in operation promoted. All of these things are indispensable to effecting proper adjustments of the public relations of the utility companies. The responsibility for them must be lodged somewhere; the commission is the proper agency to undertake such responsibility. A limited responsibility or a divided one is inadvisable. Nothing like responsibility breeds care, conservatism and judicial discretion. The public interest in the utilities being the dominant one, it is fitting that the public body should be charged with the responsibility. And so, also, the state should give to the findings and orders of the commission the full and binding effect of laws, with no right of review by the courts except on the constitutional issues of deprivation of private property without just compensation and denial of due process of law.

BENEFITS TO TELEPHONE COMPANIES.

Removal from Politics.—Telephone companies are greatly benefited by such a commission as suggested. It affords them a means of trying out on their merits their contentions for rate increases and adjustments. Whether franchise rights and duties are abrogated by the commission law is largely immaterial, though it is desirable that they should be in order that the commission may have unrestricted control of the situation. In any event, the facts regarding the merits of desired changes may be ascertained before the commission, and bearing the commission's stamp of approval franchise modifications should result naturally. The public necessarily has a large degree of confidence in its state commission composed of men of known ability, integrity and devotion to the public welfare. A larger degree of certainty comes to attach to the industry than formerly experienced. Political influences are reduced to a minimum. Returning from a recent trip through the West, Mr. Otto H. Kahn, of the New York banking firm of Kuhn, Loeb & Co., said: "The railroads must get out of politics and in with the people." The same remark might be applied to telephone companies. The state commission affords them the opportunity they earnestly seek to get out of politics and in with the people.

Means of Abolishing Discriminations.—The state commission eliminates feuds between the public and telephone companies. Passion and prejudice no longer have the opportunity to influence the public relations of the companies. The commission elevates the plane of the telephone business by promoting mutual respect between the public and the proprietors and managers of the telephone enterprises. It abolishes unjust and unreasonable discriminations by relieving the companies from the improper influences of individuals and organizations possessing political and other power in their own communities. Discriminations of an unjust and vicious character amounting to upwards of $30,000 a year were discovered by the Railroad Commission of Wisconsin in the telephone business in Wisconsin. Under the commission's orders this money was added to the revenues of the companies who were entitled to it.

Business Conditions Promoted.—The commission provides a clearing house for facts and information pertaining to the business. In the offices of the commission, data are available showing the results obtained by all the companies in the state in the operation of their properties. Construction costs and operating expenses of all kinds may be studied to advantage by the use of the material accumulated by the commission. The experts of the commission are constantly prepared to advise the companies about details arising in their various lines of work. Improvements in business methods are effected by this free intercourse and exchange of ideas. Investments are made more attractive. Risks of the business are reduced. Reports bearing the approval of the commission are published and convey authentic information to investors and prospective investors which inspire confidence in telephone enterprises.

BENEFITS TO THE PUBLIC.

Public Interests Advanced.—The commission benefits the public by the assurance which it affords that rates are reasonable and compensatory and that service is adequate and of a reasonably high standard. By eliminating obnoxious discriminations it places all patrons of the service on planes of substantial equality. By protecting reasonable rates and insuring equality of treatment the commission raises the moral tone and moral standard of the community. Relations with the companies are no longer attended with controversies and acrimonious disputes. The public service is promoted and advanced. Telephone subscribers multiply in number and the use of telephone facilities increases to the fullest possible extent.

TELEPHONE ASSOCIATIONS DESIRABLE.

Active Co-operation with Commission.—It is not enough that the public alone should make a systematic and organized effort to promote the public relations of telephone companies. The latter are responsible in the first instance for the service and they have a vital interest in the subject-matter of commission activities to the end that the private rights of the proprietors be fully protected. They might well afford to take the initiative and organize for the express purpose of co-operating and keeping in close official touch with the public. This would appear necessary if the maximum benefits are to be derived from the work of the commission. In matters of service requirements and rate adjustments the industry can afford to be well prepared to advise the commission definitely and concisely. Problems arising in one locality may be of great importance to companies in other sections. The industry cannot afford to adopt an indifferent attitude in the face of investigation and inquiry by the commission. One of the most important duties of the commission is the fixing of rates. The industry as a whole should work out for itself a correct basis for rate adjustment and present it to the commission. Co-operation along such lines would be welcomed. The im-

portance to the industry of such problems is so great that every consideration of self-interest prompts a large measure of such co-operation.

State and National Associations.—All the telephone companies operating under the jurisdiction of a single state commission might join hands and maintain to advantage an association for the purpose of representing the industry at large before the commission. Such association might also co-operate with like associations in other states for the working out of problems of mutual concern. There is a field for a national association to represent all of the companies before the Interstate Commerce Commission, and in other like matters of common concern. These associations might have different branches representing the different lines of endeavor in which the commissions are interested. There might be accountants' divisions, traffic men's divisions, engineers' divisions, and such other divisions, as the circumstances may require. The entire question of the adequate representation of the industry before the commissions is worthy of careful analysis and development.

STATE COMMISSION ON TRIAL.

Commissions Mostly Successful.—It would be foolhardy to assert that state commissions offer a final and conclusive solution of the problems of the public relations of telephone and other public service companies. After all is said and done, experience with state commissions has been limited, compassing only a comparatively brief period. The early commissions exercised but little real authority over the companies subject to their jurisdiction. Real responsibility for public relations was withheld from them in a large measure. Even today many state commissions are not afforded a fair opportunity to demonstrate their usefulness to the public and the utility companies. It is fair to say that the New York and Wisconsin commissions, which have been given a very large measure of power and responsibility, have justified themselves many times over to all parties interested in their activities. Some of the commissions possessing large powers have not been so successful in inspiring confidence in their endeavors, but this may be the result more than anything else of bad starts and of lack of co-operation on the part of the utilities affected. The Interstate Commerce Commission may fairly be said to have been very successful.

State Commission Logical.—The state commission may not hasten the approach of the millennium. But it offers a good, sane and logical solution for a difficult social, economic and political problem. The state commission is with us and promises to stay with us for many years. Who will say that it will not outlive its usefulness and give way in time to—what? Does the handwriting on the wall point to state ownership or not? Whatever may be the individual opinion on this much converted question, the practical solution of the present day problem is afforded by the state commission. It behooves those who appreciate the situation to take their places in the van and lead thought and action on the subject. May the time come, and come speedily, when the telephone and other privately performed public services may be used as freely and as understandingly as the postal service, when rates may cease to be a source of controversy and unrest, when honor and credit of the highest degree may attach to employment in the public services, and when investment in public utility undertakings may enjoy most substantial financial credit. Let the public and its self-constituted servants in the public utility enterprises join hands and strive earnestly and sincerely for their mutual and common welfare!

Testing the Commission's Worth.—The commission is a valuable public agency if it contributes to the mutual ends of both of the principal parties, and not otherwise. The success of the commission and of the commission law may be judged only after they have been in operation sufficiently long to make their impressions on the state. They are successful if under them a high grade of service is being furnished, rates are fair to the public and compensatory to the companies, operation is efficient and economical, all unnecessary risks are eliminated, and capital is flowing freely into the utility enterprises.

Rates in London

Telephone rates for measured service in London, which have often been cited as examples of low cost service, are much the same as the scheduled rates in effect in Boston under the plan recommended by the Massachusetts Highway Commission, states Prof. Dugald C. Jackson, head of the electrical engineering course of the Massachusetts Institute of Technology and president of the American Institute of Electrical Engineers, who has just returned from England.

Prof. Jackson has been in England in the interests of the British government in the making of an inventory of the properties of the National Telephone Company, which controls the entire telephone system of the British isles, and whose properties are to be taken over by the government at the end of this year.

A few years ago the government took over the control of the long distance telephone business, and in 1905 established a great exchange plant in London. Prof. Jackson, referring to this work, said that it had often been claimed by those who argued for cheaper telephone rates in this country, that this London exchange furnished a much cheaper measured service than that of American companies, but that the statements were without foundation of fact, as the rates maintained there were substantially the same as those now in effect in this city.

Prof. Jackson expects to return to England next summer to work on the appraisal of the telephone properties.

Wisconsin Court Defines Commission Power

The Wisconsin Railroad Commission has the power to abrogate a contract entered into in the form of a franchise granted by a city to a public-service corporation, and may render null and void the provisions of that franchise, according to a decision handed down recently by the Supreme Court in the case of the City of Manitowoc against the Manitowoc & Northern Traction Company. The decision means that no franchise now in effect has the force of a binding contract between the parties thereto, provided the commission sees fit to step in and alter any provisions in the franchise. The Supreme Court stated that the state has never surrendered its governmental power of fixing rates, but that by Sections 1682 and 1683 of the revised statutes, that power was merely suspended until such time as the state saw fit to act.

Equipment of the Murphysboro Exchange

By Gifford Wheeling

THE 600-line magneto board that had been doing service in the Murphysboro exchange of the Murphysboro Telephone Company was replaced not long ago by a common battery equipment with a capacity of 2,400 multiple jacks. The new exchange consists in detail of the following: A switchboard with two six-panel, three-position sections, chief operator's desk, wire chief's desk, main and intermediate distributing frames, power plant and ringing equipment.

Provision has been made for the future telephone needs of Murphysboro in the equipment of the new exchange. The office has a capacity of four six-panel sections, with but two now in use. Four subscribers' operators' positions have been equipped, the ultimate capacity being six. There is also one combination toll and rural position.

The capacity of the switchboard is thirty rural and thirty toll line circuits. Its present equipment is ten rural and twenty toll line circuits. The board is equipped with twenty outgoing trunks, including the trunks to the toll and rural positions and chief operator's desk, besides its equipment of line jacks.

All the exposed woodwork of the switchboard is of mahogany, and it presents the neat appearance characteristic of this type of exchange. The sections are built on an iron frame to insure solidity and strength. The three-position units are so arranged that additional sections may be added as required until the ultimate capacity of lines is reached. The key-shelves are wide and comfortable, and the apparatus in the rear of the sections is securely mounted and conveniently arranged to allow easy access for inspection.

The apparatus connected with the operation of this switchboard, including cords, cord weights, plugs, jacks, keys, lamps, lamp caps, line and supervisory relays, repeating coils and switchboard cable, conform to the quality standard which is observed throughout the manufacture of this equipment.

The local cord circuit is of the well known repeating coil type, with a relay for each cord circuit controlling the supervisory lamp. Each circuit is equipped with double lamp supervision, one lamp for the answering cord and one for the calling cord.

The Operating Room at Murphysboro, Illinois.

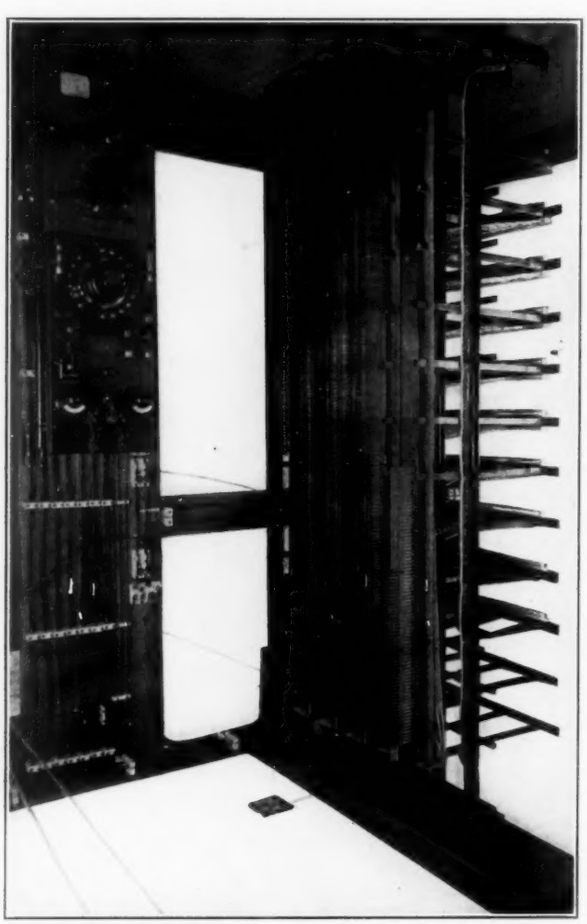
The magneto toll and rural lines connected with the Murphysboro exchange are equipped with the self-restoring combined jack and signal. This can plainly be seen by the inspection of position one in the accompanying general view of the operating room. Designation strips have been furnished for each strip of toll lines so that they may be more readily identified.

The chief operator's desk is fully equipped, with provision for a single chief operator. This desk contains trunks to the switchboard and to the wire chief's desk. It is provided with equipment for talking and ringing on the lines and observing the work of the switchboard operators. The chief operator's desk is of suitable design and of a finish to match the switchboard proper.

Then there is also a wire chief's desk, with test lines to the switchboard and the main distributing frame. The desk is provided with a Weston voltmeter and all necessary appliances to enable the wire chief to make rapid and accurate test.

The protective devices in the main distributing frame have been arranged to make the work of protection as effective and simple as possible.

The power plant has a capacity to care for the ultimate equipment of the exchange. It consists of a mercury arc rectifier, a storage battery, power board, ringing equipment, power wire and insulator and battery panel. As the requirements of the exchange increase elements may be added to the storage battery cells, of which there are now two sets of eleven each, until the capacity of the jar is reached.



A Corner of the Murphysboro Terminal Room.

Wire Chief's Desk and Ringing Generator.

The entire equipment was furnished and installed by the Western Electric Company. It is known as the No. 10 common battery exchange equipment.

New Chicago Report

Declaring that the Chicago Telephone Company is earning only 4.64 per cent on an investment of $24,285,905.35 and taking issue with many of the salient features of the Hagenah commission's supplementary report of its findings presented to the council committee on gas, oil and electric light last June, a new finding on the Chicago telephone situation was presented to the city council by Arthur Young & Company.

The original report sent to the committee by Young & Company was made in conjunction with the engineering firm of D. C. & W. B. Jackson. It was discarded by the committee, and Mr. Hagenah and a corps of experts were employed to make a new investigation.

The supplementary report, which was sent to the council by Comptroller Wilson, defends the Chicago Telephone Company's contract with the American Telephone and Telegraph Company, under which the local concern pays 4½ per cent of its gross earnings to the American Company for "patent rights," and strengthens the old report.

The Hagenah report declared emphatically that this contract was excessive to the amount of about $147,000 per year.

Press Reports by Telephone

Hereafter the gathering and dissemination of state and world news by the Associated Press will be done by long distance telephone on special wires to Iowa members of the association. The world's news will be gathered as usual at Chicago and relayed by leased wire to Des Moines, where a manager will be in charge. The news of the state will be gathered at Des Moines and all news will be dictated from there over long distance telephone wires to the offices of the members. Typewriter operators will transfer the news directly to manuscript sheets unskeletonized. The day service will entitle the evening papers to the news from 7 A. M. until 6 P. M.

Iowa is the first state to transmit news reports by long distance telephone wires.

Submarine Cables for Telephone Work

By Major W. A. J. O'Meara*

THE first submarine cable of any length specially designed and provided for telephonic purposes by the British Postoffice was that between St. Margaret's Bay and Sangatte, laid in 1891. The weight of copper and gutta percha in the cores was so proportioned as to make them specially suitable for use in connection with considerable lengths of land wires. The data available in 1890, when the first Anglo-French cable (referred to above) was designed, were naturally somewhat incomplete, but the results obtained with the first telephonic circuit between London and Paris have proved eminently satisfactory from the date of its first use.

In 1887 Oliver Heaviside gave the essential parts of the theory of telephonic transmission, pointing out the importance and beneficial effects of self-induction, and stating the relation which must exist between the constants of a circuit in order that electrical waves of all frequencies may be transmitted without distortion. It was many years, however, before any attempt was made by engineers to apply the mathematical deductions which Oliver Heaviside had placed within their reach to the solution of practical problems in connection with long-distance telephony.

So far back as 1891 Silvanus P. Thompson obtained a patent for the employment of distributed inductances, leaks, etc., and this patent specification may be considered to have afforded independent testimony to Heaviside's views. Engineers, however, were not convinced as to the practicability of effecting improvements in telephonic transmission by this means, and therefore a solution to the problem was sought by devising a method for materially reducing the electrostatic capacity of submarine cables. In 1897 an air-space type of cable designed by Messrs. Willoughby S. Smith and W. P. Granville (Patent Specification No. 8573, of 1895) was laid between the mainland and the Isle of Wight, a distance of about two knots; and in 1898 a similar type of cable was laid between England and Ireland. As a matter of interest, it may be mentioned that the Roentgen rays were used for the examination of the joints made in the 1898 cable; and

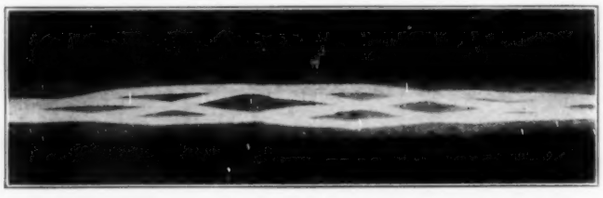


Fig. 1. Radiogram of Joint in Air-Space Gutta-Percha Cable.

the radiogram, Fig. 1, clearly brings out the arrangement of the conductors and the method employed in connecting them together at junctions of the several sections of the cable.

When this Anglo-Irish cable was tested under practical conditions a very serious defect was discovered, namely, that when two telephonic circuits were formed on the four wires, it was not possible to carry on conversation simultaneously without overhearing; in fact, serious inductive disturbances existed between one pair of conductors in the cable and the other pair. Experiments made on this and on an ordinary type of cable proved:

(1) Commercial telephonic communication between terminal points connected by a 60-knot length of the ordinary submarine telegraph cable of the stand-

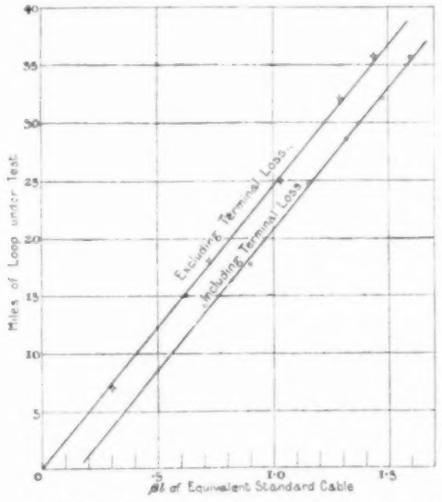


Fig. 2. Efficiency Tests of Continuously Loaded Cable.

Length, 1.78 miles. Type, 4 quads + 12 pairs. Copper, 2 mm². Iron, one layer 0.37 mm. wire. Loop resistance per mile, 27.64 ohms. Wire-to-wire capacity per mile, 0.08 microfarad. Inductance per mile, unknown.

ard type is possible, but there is not margin available under such conditions for extending the range of communication beyond that distance.

(2) The air-space type of cable of a similar length—60 knots—does afford a sufficient margin for extending the range of telephonic communication very appreciably if combined with suitable aerial conductors, but the existence of overhearing between the two pairs of conductors, and the disturbances introduced by utilizing one pair of wires for telephonic purposes and the other two wires simultaneously for high-speed telegraphic purposes, precludes the employment of this type of cable for telephonic purposes wholly, or for joint telephonic and telegraphic purposes, unless the telegraph circuits are impeded and worked at a low speed.

When the question of laying an Anglo-Belgian cable in order to establish direct telephonic communication between London and Brussels came up for consideration, it was decided, in view of the failure of the air-space cable, to use the same type as the original Anglo-French cable.

In 1908 it was decided to provide four additional circuits (i.e., two new cables) between England and France, each country providing and laying one.

Three methods of increasing the range of telephonic transmission, so far as submarine cables are

*Abstract of paper read before the British Institution of Electrical Engineers.

concerned, have been prominently before the engineer-in-chief's staff, viz.:

(*a*) By the use of heavier copper conductors, and by an increase, at the same time, of the separation between them.

(*b*) By the provision of one or more closely arranged layers of suitable iron wire over the whole

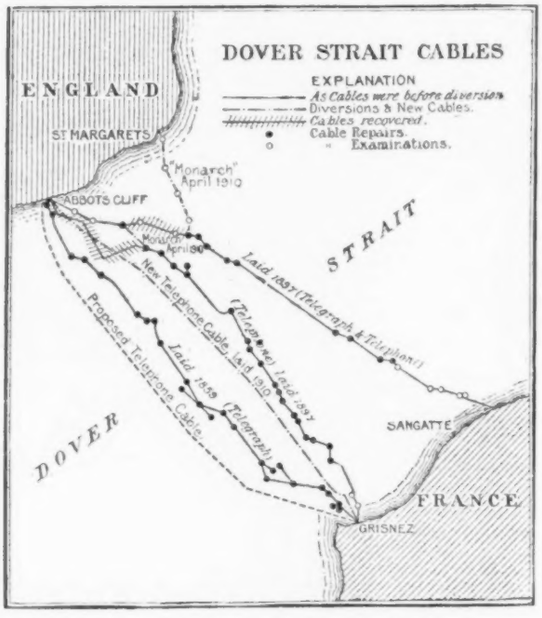


Fig. 3. Charts Showing Cable Repairs, Divisions, Etc.

length of the copper conductors in the cable—the so-called "continuous" loading system.

(*c*) By the introduction at regular intervals of suitably arranged inductance or loading coils—the so-called "non-continuous" or "coil" loading system.

Two varieties of cable in which it was proposed to obtain increased efficiency in transmission by the employment of a larger quantity of copper per unit of length were submitted to the engineering department. In both of these designs provision has been made for the introduction of layers of papers between the copper and the gutta-percha. Paper appears to be a somewhat unsuitable material to employ in the manner proposed on account of its hygroscopic qualities, which causes it to absorb moisture from the gutta-percha, quite apart from the question of the probable high cost of maintenance that a cable in which paper is used may involve. However, an effort is being made to discover some effective means of overcoming the practical difficulties which have been encountered, owing to the moisture exuding from the gutta-percha.

The question of providing cables of higher efficiency comes under consideration only as the distances of the points between which they are required become relatively great; in such cases the magnitude of the capital cost involved in providing the cables rises in a nearly geometrical ratio if the problem is solved by the simple expedient of increasing the weight of the copper conductors, and for this reason proposals for heavier copper conductor types of cable have in recent times been in abeyance.

The two practical methods—that of "continuous" loading and of "non-continuous" loading—have been the only ones considered, and the advantages and disadvtanges of these two types of cable have been very thoroughly studied. It has been found that it is not impossible to predict with sufficient accuracy, by mathematical calculation, the results likely to be obtained by the "continuous" loading, owing to the difficulty in attaching correct values to the electrical constants involved. In theory, the designing of a cable of this type seems to require merely the solution of the apparently simple problem of ascertaining the increase of inductance which can be obtained by providing layers of iron wire or tape of known permeability over copper conductors of known diameter, assuming that the nature of the dielectric to be employed has been determined, and that the overall diameter of the finished cable shall remain a fixed dimension.

Although such a method of applying the iron would give the greatest possible inductance, either for a given outer diameter of the iron covering or for a given weight, yet it cannot be adopted owing to the excessively large increase of effective resistance which will accompany the increase of inductance, for at high frequencies the eddy-current loss in such an iron sheath would be impracticably large. Hence the iron covering must be electrically divided, not continuous.

Messrs. A. W. Martin and J. G. Hill, of the Post-office engineering department, recently carried out a series of comparative speech tests on a number of cables of this type by the kind permission of the late Mr. C. E. Karup, engineer-in-chief to the Danish Telegraph Service. The results obtained on one of these cables are shown graphically in Fig. 2. The observed attenuation constant of another of the Danish cables is given in Table A, and for comparison therewith the

TABLE A.

Based on actual "continuously" load cable.
Overall diameter of copper, 126 mils.

Loading.	Outer diameter of gutta-percha. Mils.	$\beta \frac{1}{\text{knot}}$	
		Observed.	Calculated
Three layers of 7·88 mils iron wire	355	0·0296	0·0197
Unloaded	355	—	0·0369
Coils of 100 millihenries every 1·075 knots	335	—	0·0148

TABLE B.

Based on actual "coil" loaded cable.
Overall diameter of copper, 106·2 mils.

Loading.	Outer diameter of gutta-percha. Mils.	$\beta \frac{1}{\text{knot}}$	
		Observed.	Calculated.
Coils of 100 millihenries every knot	390	0·0166	0·0166
Unloaded	390	—	0·0766
Three layers of 7·88 mils iron wire	405	—	0·0241

attenuation for the same cable as found by calculation, and the attenuations calculated for ideal cables with the same copper conductor are also shown (1) unloaded, and (2) loaded with inductance coils. The data given in Table B relate in similar manner to a cable actually loaded with inductance coils. A wide difference is seen to exist between the ascertained values

for attenuation of "continuously" loaded conductors and those which theory seems to predict.

Investigations clearly indicated that it was possible to obtain more appreciable improvements in long-distance telephone cables by employing loading coils than by resorting to the continuous loading of the conductors. Therefore when the matter of the provision of additional submarine cables between this country and France was referred to the engineering department, inquiries were at once made to ascertain whether it would be practicable to provide, lay, and maintain in a satisfactory manner, a submarine cable of the "coil" loaded type. [The outcome of this investigation, and a description of the cable adopted, were published in TELEPHONE ENGINEER for July, 1910.]

The volume of the speech transmitted over the loaded cable was compared with that over an artificial "standard" cable, the electrical constants of which are known. The result of these tests indicated that the attenuation constant of the loaded cable was 0.0147.

If the electrical constants of the Anglo-French loaded cable are substituted in the formula—

$$\beta = \frac{R + \frac{S}{K} L}{2} \sqrt{\frac{K}{L}}$$

it will be seen that the attenuation constant obtained by the sent-and-received current test requires that the value to be assigned to $\frac{S}{K}$ in the above formula must b approximately 99, whereas the value of the attenuation constant indicated by a comparison with the artificial "standard" cable requires the value of $\frac{S}{K}$ to be 80.

There is no doubt that leakage plays a very important part in the transmission of telephonic speech. Recently, while in America, I found that one of the principal difficulties which had been encountered in that country in connection with the loading of long-distance aerial telephone circuits consisting of the larger gauges of wire was chiefly due to leakage. However, the difficulty has been largely overcome by the substitution of more efficient insulators for the glass ones which have hitherto been in general use in the United States.

We have long been aware of the great importance the ratio $\frac{S}{K}$ plays in the design of long-distance telephone circuits. In the case of gutta-percha cables there is certainly no noticeable leakage arising from faulty insulation as in the case of aerial wires; still, the dielectric currents in such cases are appreciable, and practically represent an effective leakage. Dr. Breisig finds that the value of $\frac{S}{\omega K}$ (where S is the effective leakage, K capacity in farads, and ω is equal to $2 \pi n$) is independent of the value of K; in the case where $\omega = 5000$ the value is found to be 0.018.

In dealing with the maintenance of "coil" loaded cables after they have been laid, the degree of importance to be attached to the uniform space of the coils has to be considered. In repairing cables, intermediate lengths have to be inserted at times, but fortunately if repairs of this character have to be effected in the "coil" loaded cable, no noticeable impairment in the quality of the speech will result if the coil spacing is distributed to an extent not exceeding five per cent on either side of the best location from the theoretical point of view. It has been found that when physical conditions impose a variation of not more than 50 per cent of the spacing for a single coil, no appreciable impairment in the quality of the speech will result provided the deficiency in loading is made up withing the next ten loading sections. The frequency with which repairs have been carried out on the existing telephone cables, as shown in the chart, Fig. 3, will convey some idea of the importance of this matter.

The cable has been under continuous observation since it was laid, and a large number of tests have been carried out.

The employment of unloaded 800-pound copper aerial conductors, such as are in use for important long-distance trunk circuits, will render it possible for very satisfactory conversations to take place from call-boxes between centers in England and on the Continent when the added distances from the ends of the cable do not exceed 1,700 miles; that is to say, with land-lines of this description well-maintained conversations between London and Astrakhan on the Caspian Sea would be possible.

Although great improvement in speech transmission has resulted from the latest type of cable, yet the new Anglo-French cable cannot by any means be regarded as the last word on submarine telephone cables. Many problems remain to be solved, and they do not appear to be of a character likely to yield a ready answer to those seeking their solution. As in the past, the co-operation of the mathematician, physicist, engineer, and manufacturer are still needed if an announcement is to be made twenty years hence that the progress in the art of telephony has resulted in an increase of efficiency comparable with that which has been achieved during the past twenty years.

Some Unique Telephone Bills

Wisconsin Assemblyman Kneen has introduced an unique telephone taxation bill. It requires all telephone companies to pay a state license fee of $15. In companies having less than fifty subscribers this is to be in lieu of all taxes. Other companies are to pay taxes as at present. The idea of the bill is to reach with some kind of taxation, farmers' mutual insurance companies.

In Albany, New York, Assemblyman Jacob Levy has introduced a bill similar to his measure of a year ago, requiring telephone companies, on demand of any subscriber, to furnish a monthly statement of the number of messages or calls used or transmitted, together with the name and telephone number of the subscriber called.

Any company failing to furnish the statement shall not be entitled to collect for the service, shall not be allowed to discontinue the service, and shall be liable to a penalty of $100 in favor of the subscriber for each failure to furnish such report, or for discontinuing the service.

Cecil was accustomed to hearing his mother telephone for nearly everything she needed. One day as he entered the pantry a little mouse scampered across the floor. Very much frightened, he jumped up and down, screaming: "Oh, mother, 'phone for the cat! Please 'phone for the cat!"—*Success.*

Form of Telephone Appraisal Report

By J. C. Slippy

THE problem of determining the value of telephone properties is often a formidable one to the exchange manager, due principally to his not knowing just what points should be considered in such a report, or the weight that should be given to the different factors affecting such a valuation. The following outline has been followed by the author in making reports on various properties and will be found adaptable to almost all conditions. The method of finding the present value is to determine the physical condition of the property by observation, using cost figures which represent the cost of reproducing the plant, and deducting the proper depreciation values from these sums to obtain the present value. It is customary to add from ten to fifteen per cent to the original total cost of the plant to care for legal expenses, engineering, franchises, insurance, damages, etc., where no particular information concerning these items can be obtained.

The following points are to be mentioned in making a report on a telephone company's plant. Under each division of the report are found the principal subjects upon which information should be obtained. In order to properly apply this form of report to large or small properties, the subjects upon which data is not required for any particular case shall be omitted.

Introduction:

Organization of Telephone Company:
- Purpose and need.
- Character of business expected.
- Capital stock.
- Laws under which incorporated.
- Officers and directors.
- Date of building plant.

Property:
- Telephone exchanges:
  - (a) Number and location of.
  - (b) Purchased or rebuilt.
  - (c) Rebuilt.
- Number of telephones:
  - Residence.
  - Business.

Toll Lines:
- Number of miles of pole line.
- Character and size of conductors.
- Cost and present value of plant. (See Appendix.)

Rates:
- Business.
  - Single line.
  - Party line.
- Residence.
  - Single line.
  - Party line.
- Extra charges.
  - Extension set.
  - Desk set.
  - Special apparatus.

Franchises and Rights of Way:
- Number of and territory covered.
- Liberality of franchises.
  - Tax on poles.
  - Accommodation for city wires.
  - Maximum rates for service.
  - Free service for city buildings.
  - Use of prospective city subways.
  - Term of franchise in years.

Contracts:
- Contracts with long distance companies for service.
- Per cent received by connecting companies.
- Per cent on outgoing business.
- Per cent on incoming business.

Public Sentiment:
- Character and underlying causes.

Exchange Quarters:
- Character and location of buildings.
- Floor space.
- Condition and maintenance of quarters.
  - Rented.
  - Owned.
  - Leases.

Switchboards:
- Name of manufacturer.
- Style of switchboard.
- Describe fully wiring of jacks, drops, etc.
- Distributing frame.
- Toll switchboard.
- Estimated length of life, based on general characteristics.

Substation Equipment:
- Style of instruments.
  - Receiver.
  - Transmitter.
  - Ringers.
- By whom manufactured.
- Give general description.

Exchange Construction:
- Poles.
  - Kind and size.
  - Guys and anchors.
  - Crossarms.
  - Hardware.
  - Paint.
- Cable.
  - System of distributing.
  - Pairs and size of conductors.
  - Electrostatic capacity.
  - Terminal equipment.
- Drops.
  - Iron or copper.
  - Size.
- Metallic circuit.
- Grounded circuit.
- Common return circuit.
- Original cost and present value.

Underground Construction:
- Ducts.
  - Single.
  - Mutiple.
  - Size, inside diameter.
- Terminals.
  - Ducts.

Iron pipe.
Size, inside diameter.
Depth of ducts.
Laying of ducts.
Concrete foundation.
Concrete side protection.
Concrete top protection.
Creosoted plank.
Manholes.
Brick.
Concrete.
Foundations.
Walls, thickness.
Style of casting and cover.
Handholes.
Brick.
Concrete for manholes.
Parts cement, sand and gravel.
Concrete for duct foundation.
Parts cement, sand and gravel.

Toll Line Construction:
Height of grade.
Kind of poles.
Size of poles.
Guys and anchors.
Cross arms.
Insulators.
Transpositions.
Spacing of poles.
Routing.
Highways.
Private property.
Wire.
Size.
Material.
Metallic circuit.
Grounded circuit.
Sag of.
Original cost and present value.

APPENDIX "A."

Exchange Statistics:—(The following information should be obtained for each exchange in the territory.)
City.
Population.
Industries.
Rates.
Number of business telephones.
Number of residence telephones.
Total number of lines.
Number of calls per station per day.
Per cent development.
Average monthly exchange rentals.
Rent of exchange buildings.
Number of years for lease to run.
Square feet of space rented.
Style of local board.
Name of manufacturer.
Present capacity local board.
Ultimate capacity local board.
Style of exchange instruments.
Number of positions of toll board.
Number of toll lines.
Average number of "out" calls per day.
Average number of "in" calls per day.
Total number of operators.
Total monthly receipts.
Average monthly receipts
Style of cable office terminal.
Total number of pairs, cable capacity.
Number metallic lines.
Number grounded or McCluer system lines.
Number exchange poles.
Number miles of pole line.
Kind of poles.
Size of arms.
Kind of cable.
Number feet of 100 pair cable, 50 pair cable, 25 pair cable, etc.
Size of messenger strand.
Kind of cable hangers.
Kind of wire.
Number of miles of exchange wire.
Kind of drop wire.
Total cost per station.
Total cost per line.
Total present value per station.
Total present value per line.
Total cost.
Total present value.

APPENDIX "B."

Toll Systems:—(The following information should be obtained for each toll system.)
Cost and present value of toll system from ——— to ———.
Number of miles of pole line
Number of poles.
Kind of poles.
Number of 10 pin arms.
Number of 6 pin arms.
Number copper circuits.
Number iron circuits
Number miles No. —— copper wire.
Number miles No. —— iron wire.
Cost per pole.
Cost 10 pin crossarm.
Cost 6 pin crossarm.
Cost of copper wire.
Cost of iron wire.
Cost of miscellaneous material.
Cost of right of way.
Cost of freight, teaming and traveling.
Cost of labor.
Engineering, legal, etc. Add 10 per cent.
Cost per mile.
Total cost.
Total per cent depreciated.
Present value per mile
Total present value

APPENDIX "C."

Cost and Present Value of Exchanges:—(The following information should be obtained for each exchange.)
Town.
Cost of switchboard per line.
Cost of toll board.
Cost of remodeling and furnishing office.
Cost per telephone installed.
Cost per drop wire installed.
Cost per pole equipped and set.
Cost per mile of wire strung.
Cost of cable (different sizes) per foot in place.
Cost of outside terminal and fuses per telephone.
Per cent added for general expense, 15 per cent
Central office depreciation, per cent.
Instrument depreciation, per cent.

Outside construction depreciation, per cent.
General expense depreciation, per cent.

APPENDIX "D."

Summary of Exchange Statistics:
Total number of exchanges.
Total number of stations.
Total number of business stations.
Total number of residence stations.
Per cent of business stations.
Per cent of residence stations.
Total number of lines.
Per cent of telephones on party lines.
Number of exchange poles.
Average number of poles per telephone.
Number of miles of exchange pole line.
Number of miles of copper exchange wire.
Number of miles of iron exchange line wire.
Total number of miles of exchange wire.
Number of feet of cable of all sizes.
Average number of feet of cable per subscriber's station.
Total cost to replace all exchanges at present prices.
Total present value of all exchanges after being depreciated.
Total number per cent depreciated.
Average cost per station.
Average cost per line.
Average present value per station.
Average present value per line.

APPENDIX "E."

Summary of Toll Statistics:
Number of miles of pole line.
Number of poles.
Number of 10 pin arms.
Number of 6 pin arms.
Total number of arms.
Average number of arms per pole.
Number of miles of No. 12 N. B. & S. copper wire.
Number of miles of No. 12 B. W. G. iron wire.
Total number of miles of wire.
Average number of circuits per mile of pole line.
Per cent of copper wire used.
Per cent of iron wire used.
Cost of pole line at present prices.
Cost of toll stations.
Total cost of toll line system.
Present value of toll lines after depreciation.
Present value of toll stations after depreciation.
Total present value of toll line system.
Per cent depreciated.
Average cost per mile of pole line.
Average cost per mile of wire.
Average present value per mile of pole line.
Average present value per mile of wire.

APPENDIX "F."

Statement of Earnings:
Cost of exchanges.
Cost of toll lines.
Total cost of system.
Present value of exchanges.
Present value of toll lines.
Total present value of entire system.
Average exchange earnings per year.
Average toll earnings per year.
Total average earnings per year of entire system (figures of earnings obtained from report of expert accountants).
Per cent of exchange earnings based on total cost.
Per cent of exchange earnings based on present value.
Per cent of toll earnings based on total cost.
Per cent of toll earnings based on present value.
Average exchange earnings per telephone.
Average total earnings per telephone.
Average toll earnings per mile of toll pole line.
Average toll earnings per mile of wire.

APPENDIX "G."

List of Toll Stations:
Name of town.
Population.

APPENDIX "H."

List of Connecting Exchanges:
Town.
Owned by.
Population.
Number of telephones.

Effect Of Proposed Canadian Reciprocity

It is proposed to admit into the United States free of duty all lumber from Canada not further manufactured than sawed. At present rough lumber is taxed $1.25 per 1,000 feet. On planed or finished lumber the rates will also be considerably reduced. The value of these tariff modifications to the American consumer is evident. The production of lumber in the United States, which had remained nearly stationary for several years prior to 1908, decreased in the latter year to an amount less than the production in 1900. The timber resources of the northern and central states have been exhausted or greatly depleted; and since 1907 our exports of lumber have fallen off, in spite of the rapid exploitation of our southern and far western supplies.

By the terms of the agreement the United States will admit without duty railroad ties, paving posts and telegraph posts, etc., when imported from Canada. These articles are at present dutiable at 10 per cent, and large quantities are being imported even under this rate.

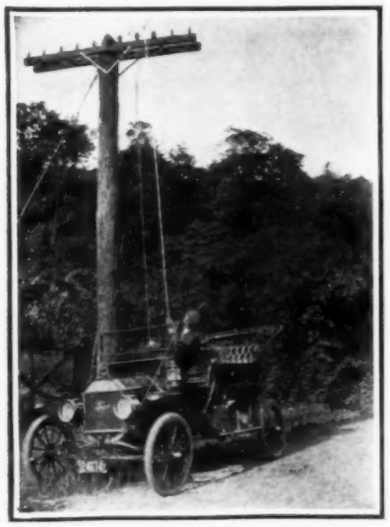
Under the pending agreement Canada will reduce her duty on automobiles and parts thereof by one-seventh, or from 35 to 30 per cent ad valorem. Our duty is reduced from 45 to 30 per cent, but as the manufacture of motor vehicles in the Dominion is still in its incipient stages, the net effect of the arrangement will be to give American manufacturers permanent control of the Canadian automobile market. During the calendar year 1910 we exported to Canada automobiles and parts to a value of over $5,000,000. Canadian statistics substantially verify this figure, although desire to decrease the duties to be paid has led to a lower valuation. Canadian imports for the first eleven months of 1910 are stated at $3,563,340. The duties to be remitted by Canada will thus range between $200,000 and $250,000 per annum.

In order to constitute a quorum at a special session of the Madison County Council at Anderson, Indiana, recently, J. H. Himelick, a member of the council detained at home sick, was called to the telephone fourteen miles from the city and listened to the proceedings. When his name was called he voted on each proposition over the telephone and declared he understood all that was done. He directed the auditor to sign his name to the record which declares he was present and voting.

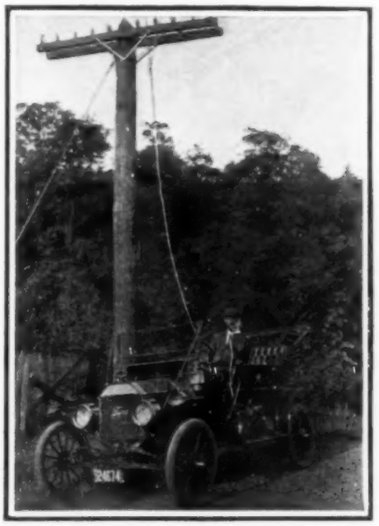
The Telephone Scrap Book

A Telephone for Automobile Use.

AUTOMOBILISTS have often wanted a means of communicating with the nearest town when they get into trouble or meet with an accident. With the device illustrated here they can have telephone connection from any point in the rural districts where there are overhead telephone wires, within two minutes, without leaving the car. The device is also useful to officers in pursuit of criminals. It is composed of a hand microphone and cord. The cord and attachments are lifted to the wires above by means of a jointed aluminum rod, which is packed away in small compass when not in use. At the top of the rod is a clip. This clip with which the connection is made consists of two strips of metal riveted together at the bottom and formed with slots about the size of an ordinary wire. These strips open slightly at the top for the purpose of receiving the telephone wire. This makes the metal connection. When pressed upward by the aluminum rod with the telephone cord attached, the wire drops into the slot and the metal clip closes on it, sustaining quite a considerable weight. When through talking the automobilist detaches the connection by a slight jerk forward or backward. The moment the cord is pulled on at a sharp angle with the wire, the clip is pressed open and the attachment drops to the ground.



Establishing a Connection.

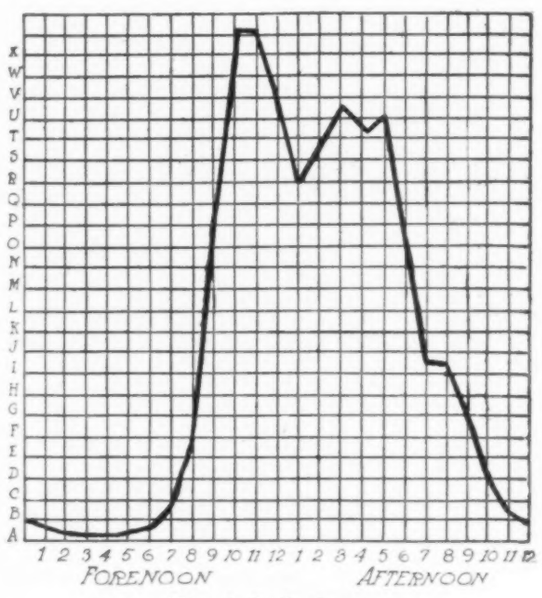


Telephoning from an Automobile.

This device was invented by an independent telephone man in Oklahoma. It is the intention to place it on the market for users of automobiles.

Chicago's Traffic Curve

THE big daily papers have been giving some attention lately to telephone traffic conditions, with the result that some very interesting traffic curves have come before the public eye in our big cities. An example is shown in the accompanying traffic curve of the Chicago Telephone Company's Main office, which appeared in one of the Chicago papers recently. Chicago's peak load, as will be seen, comes about 10:30 a. m. During the early morning hours the traffic is very light, but increases enormously with the awakening of the business activities of the day and approaches the high point of the day between 10:30 and 12:00 oclock. From this point the traffic curve dips during the lunch hour, but mounts again during the afternoon, but seldom to as high a point as during the forenoon. A third point of activity in calls develops between 7 and 8 o'clock in the evening, when social engagements are made and broken. The point of lowest demand is between 3 and 5 a. m., including the quietest hours of Chicago's day.



Chicago's Traffic Curve.

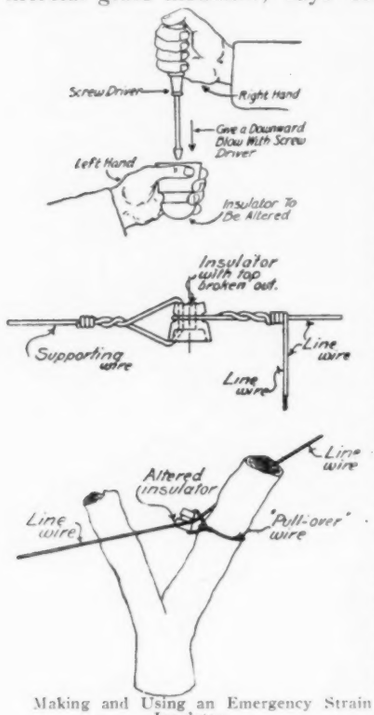
Just as there is a daily peak due to the fluctuating demands for service in the daily cycle of activity, so there is a greater cycle covering the entire year. This annual traffic curve shows its period of least activity in the hot summer months, when business is at its lowest ebb and vacation is the fashion, and it rises during the fall months, coming to the point of greatest activity in the winter. This produces a peak upon a peak, and it is this daily maximum demand on the day of the greatest yearly demand which creates the traffic problems which cause distress to telephone officials.

It is possible to analyze the peak load so as to determine what class of subscribers are mostly responsible for this great peak demand for service, with its resulting high operating cost. To arrive at a rate

of charge which is to be reasonable to all classes it is necessary to give to each class, in so far as this is is possible, a proper consideration of its effect on the traffic in producing this great cost. The existence of conditions making for the development of a peak load are inherent in most utility services. The correct rate schedule recognizes these conditions, and by the proper balancing of charges between classes of service should tend to minimize these forces to the end that a traffic curve may be developed with less violent fluctuations in the demand for service and the resulting expense.

An Emergency Strain Insulator.

A STRAIN insulator that gives entirely satisfactory service when used with ordinary good judgment can be made by knocking the end out of a commercial glass insulator, says H. L. Beardsley in the *Electrical World*.



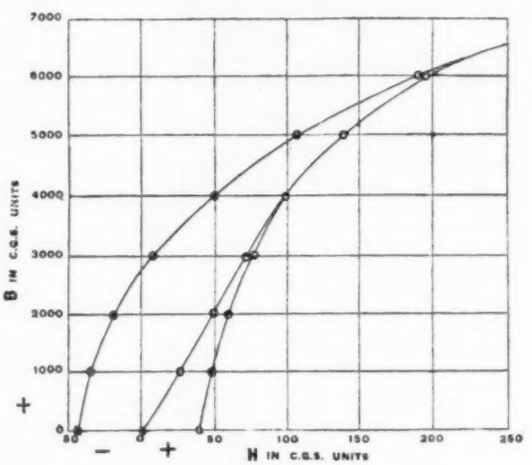
Making and Using an Emergency Strain Insulator.

Any heavy tool having a portion suitable to reach the bottom of the glass insulator may be used for altering the insulator instead of the screwdriver shown in the upper figure. The insulator is held with the left hand and with the tool a sharp downward blow is given into the cavity of the insulator and against the bottom. Usually its top is cracked off on a reasonably regular plane.

The second figure shows one of the many methods of making up the wires about an altered glass insulator. In the illustration the line wire is shown in the groove and the supporting or pull-over wire is shown threading through the hole. This arrangement need not necessarily be followed. Altered insulators can be used for tree insulators as suggested in the lower figure. Where a line wire is in contact with the limb or branch of a tree it is usually possible to eliminate the contact by placing the line wire in the groove of an altered insulator and pulling and tying it away from the offending member with a pull-over wire. The line wire is sometimes tied in the groove of the insulator, but, as a rule, this is not desirable because if the line wire is tied the swaying of the tree may break the conductor.

Cast-Iron Permanent Magnets.

THE London *Electrical Review* recently published an article on the manufacture of magnets of cast-iron instead of steel. It is interesting to record that during the past year the manufacture of such magnets has been established in this country, and there are now over 1,500 cast-iron permanent magnets being manufactured every week for certain uses. The magnets are made from ordinary black iron, and after being cast into the required shape, are annealed, cleaned, and afterwards machined, drilled and tapped to suit the apparatus or machine they are intended for. After this work has been completed and the parts are ready for fitting together, the iron is placed in a special furnace and heated to a predetermined temperature, at which it is kept for a definite time; it is then placed in a chemical bath, which carbonizes the iron to the center. The iron is finally washed in running water, dried and magnetized in the ordinary way. It might be suggested that this was only a form of case hardening, but the iron, if broken, will be found to be as hard at the center as it is on the surface. The relative magnetic strengths of the steel and cast-iron magnets are stated to be: Steel, 100; cast-iron, 85 as a minimum, and 90 as an average. As regards the magnetic properties, the cast-iron appears to be quite as good as steel, and the curves shown give the results of tests carried out for the manufacturers at the Manchester School of



Half-Cycle of Magnetization of Cast Iron Magnet.

Technology. From exhaustive tests the makers claim that the permeability is as good after fifteen months as when first turned out. The most valuable point from the practical side is the saving in cost of manufacture as compared with that of steel, the saving varying from 25 per cent to 50 per cent according to the particular design and shape chosen, as the work varies considerably with the different shapes required. In addition, it is possible to cast far more intricate shapes in iron than in steel, and, as an instance of this, it is possible in instrument work for the magnet to be cast with poles and screwing-down lugs all in one piece, thus obviating the expense of grinding both the magnet limb and pole pieces, the drilling and screwing, and, above all, the risk of the poles slipping in transit. We understand that these cast-iron magnets have already been adopted by several instrument makers, and amongst the numerous uses to which they have been put are the manufacture of telephones, relays, meters, magnetos, and small motors and dyanmos.

The makers of the cast-iron magnets, F. Burks & Company, Ltd., Salford, England, are using large numbers of them in the construction of an electrical massage machine and a small magneto.

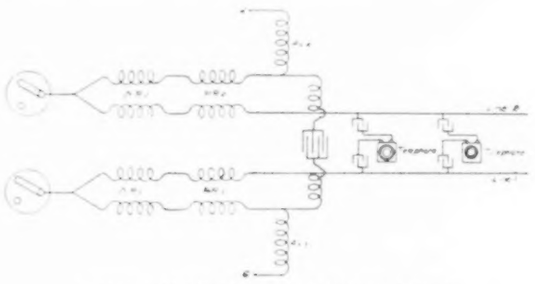
Combined Quadruplex and Telephone Circuits.

WHERE two quadruplex circuits parallel each other along the railroad right of way and a Morse circuit is not available, or by reason of too many relays, is not adaptable to telegraphone circuits, it frequently becomes necessary to bridge the quadruplex circuits for a telephone line by using condensers on each side of the telephone and tapping the quadruplex circuits at the different stations along the line, the trainmen being provided with a forked pole for cutting in at any point between stations.

This makes an ideal telephone circuit with all the necessary retardation in the quadruplex apparatus at each terminal to back it up, but, unless some provision is made to balance the two telegraph circuits with each other there will surely be trouble on the circuit which has a short end battery to line while the other has a long end battery to line. In other words, it will be impossible to make both circuits work four cornered simultaneously, due to the kick through the condensers bridged across the lines.

L. C. McIntosh, in *Telegraph and Telephone Age*, says that by introducing a similar arrangement, minus the telephone instrument, across the artificial lines of the two circuits the interference can be entirely eliminated. To do this it is only necessary to tap the artificial lines at the terminal stations at their entrance to the rheostats and connect an adjustable condenser between the two with an adjustable resistance on each side of the condenser, as shown in the illustration.

If a pre-determined number of telephones are installed on the circuits and not more than one is connected or disconnected at a time, as would be the case when trainmen cut in and out, the condenser and resistances can remain at a fixed value, and after the capacity required is once definitely established by the use of adjustable apparatus, permanent resistance and blind condensers can be substituted. There will then



Combined Quadruplex and Telephone Circuits.

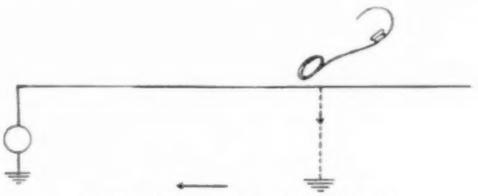
be no necessity for a change, as the addition of one telephone set will hardly be perceptible after a certain capacity has been introduced.

A circuit is operating over the Southern Pacific lines between Los Angeles and Bakersfield, Cal., with telephones bridged across the two quadruplex circuits with much success. Before the condensers were introduced across the artificial lines, it was impossible for us to work four corners on both circuits simultaneously. I believe that it is possible to extend this telephone circuit to San Francisco, the distant terminal of the quadruplex circuits. It might be necessary to transpose south of Bakersfield on such a long line, but the wires separate and take different routes north of that station.

The Telephone for Locating Grounds

A METHOD of locating grounds on underground wires, using only a telephone receiver, an exploring coil and a source of current, is described in the *Electrical World* by Felix Wunsch. The source of electricity, which may be either alternating current or direct current interrupted by a buzzer, is connected between one end of the line and ground, the other end of the line being left open. No good wire is required, and in this respect the method possesses an advantage over the loop tests, as a good wire is not always available.

The exploring coil is composed of a number of insulated copper wires, the ends being brought out to the terminals of the head telephone receiver. When the exploring coil is brought near a wire carrying



Locating Faults by Telephone and Coil.

alternating current or an interrupted current, a noise is heard in the telephone receiver caused by currents that are set up in the exploring coil by electromagnetic induction. To locate a ground, the exploring coil is passed along as close as possible to the faulty line, starting from where the line is connected to the source of electricity until a spot is reached where the sound in the telephone receiver starts to decrease, and perhaps ten or fifteen feet further on ceases altogether. The ground will be at the point where the sound starts to decrease. Mr. Wunsch located a number of grounds all within three feet of the actual spot by this method on an underground transmission line about a mile long, the faulty wire being about five feet under ground. The exploring coil used was two feet in diameter of circular shape and consisted of about 500 turns of No. 18 insulated copper wire. The wire was kept in place by insulating tape; the ends being brought out to the terminals of an ordinary telephone receiver of 100 ohms resistance. This receiver had a head-gear attachment and could have been fitted with two receivers, one for each ear for use in noisy places. With this combination a 60-cycle alternating current as small as 1/10 ampere in the faulty wire gave a sound in the telephone receiver when the exploring coil is five feet away from the faulty wire.

This method can be used when there is more than one ground on the line and the loop tests are useless In this case, when moving away from the source of electricity, the sound will decrease at the first ground and will cease altogether at the second ground, thus locating both.

To Regulate Telephone Rates

A bill authorizing cities and towns to regulate telephone rates has been introduced in the Iowa state senate by Senator Cowles and in the house by Representative Ritter of Des Moines. The measure gives cities and towns the same authority in fixing telephone rates as in establishing the rates on other public utilities.

Early Telephone Development in Japan

It will be generally admitted that the degree of civilization which a nation has reached may be observed by the development of its means of communication. This remark can be well applied to Japan, for in a quarter of a century that country has established a system of telegraph and telephone lines which is as widely extended and as well operated as the European systems. It was only about forty years ago that Japan commenced to profit by the advantages of Western civilization. It called upon European and American professors and teachers, who taught the different sciences as well as their application in practice. The Japanese have a remarkable aptitude for such studies, as was found, and they devoted all their energy and ardor to profit by the new instruction. They have a remarkable intelligence and possess a great faculty of assimilation, being also diligent in working. In a few years the Japanese acquired an amount of knowledge for which other nations would have needed a whole generation, and showed that they had scarcely any further need of education in order to continue their rapid evolution in progress and civilization. Thus as regards telegraphy and telephony, Japan is now self-sufficient, and has no more need of foreigners for directing the large companies which have been formed. The rapidity with which these two branches of electrical work became developed is quite remarkable. The most curious fact which is to be observed is that formerly the Japanese found no need of a more rapid and practical means of communication, seeing that the government was obliged to compel their use by law during the first stages.

The first telegraph engineers who were called to Japan came from England in 1868, and at the end of 1869 the first telegraph line from Tokio to Yokohama was laid and operated. For a period of ten years after this there was nothing more accomplished in the way of telegraphy. The government even considered it as a "devil's invention." At the time of the civil war, when the feudal system of Japan was destroyed in the great revolution which took place, the services which telegraphy could render became better appreciated and this awakened a great enthusiasm for the new method of communicating at a distance. Accordingly, as soon as the war was ended the government took up the matter in earnest and greatly extended the system. The Japanese lines were connected with the international system, and in 1879 Japan formed part of the International Telegraph Union. All the large cities rivaled with each other to have a telegraph station, and it was found difficult to satisfy all of them at once. The government accordingly obliged them to contribute to the expense of installation. In spite of such contributions the demands of the different cities became more pressing and numerous and it was necessary to establish new lines. The entire system was completed in 1884. A period of only five years had sufficed to cover the whole country, and the number of lines was greater than that of Italy. In the following period the connections with foreign countries were greatly extended, involving the laying of submarine cables to connect Japan with Corea. Then a system was established to the island of Formosa. Afterward a connection was made from there to China. During the recent war with China a number of military lines were laid and these have since been used for commercial purposes.

During the first period the personnel of the telegraup system was entirely made up of foreigners, but since 1879 it is exclusively Japanese, only employing English engineers for laying the submarine cables. Since 1890 even this difficult work is done by the Japanese. A number of cable-laying ships are in use, and these are equipped with modern apparatus. As regards the Japanese telegraphic material in general, the line construction does not differ very much from that of Europe. Pine or thuya wood poles are used, and these are impregnated with sulphate of copper to preserve them from rotting. The poles last ten years or more. Porcelain insulators are used. At first iron wire was employed, but at present nothing but copper or bronze is used.

The first telegraph apparatus in Japan came from America in 1852, and it was followed by Breguet (French) apparatus in 1869. A short time after, the Austrian administration proved the value of the Morse instruments, which were definitely adopted in 1873 and a construction shop was erected. This establishment was able in the next five years to turn out all the apparatus which was needed for the Japanese lines. From that time on all the instruments are of home make.

The establishment of the telephone in Japan is of a more recent date. Its progress is even more remarkable than that of the telegraph. The first experimental telephone line was run in 1890 from Tokio to Yokohama, and it is curious to note that the interurban line preceded the urban. But a few years were needed for the Japanese to appreciate the other "devil's invention," for in a short time a very extensive system was installed, and not later than 1901 there were 78,000 miles of urban lines, 6,000 of interurban (in 66 lines), 25 central exchanges, 179 public telephone cabins, and 25,000 subscribers. These figures have since been greatly increased.

Weights of Cedar Poles

The following table of weights for cedar poles is reproduced by courtesy of *Data*, Chicago:

ESTIMATED WEIGHTS FOR VARIOUS SIZES OF TOPS—SEASONED CEDAR POSTS AND POLES.

Length, inch.	2	3	4	5	6	7	8	7-9	9-11
	Weight in Pounds								
7′ Round	10	17	24	35	50	65	75	...	...
7′ Sawed ½	...	...	...	17	22	30	...	...	...
7′ Sawed ¼	...	...	...	...	...	...	...	17	22
8′ Round	...	...	35	45	55	75	90	...	...
10′ "	...	...	45	55	75	90	125	...	...
12′ "	...	...	55	75	90	110	...	...	...
14′ "	...	...	70	85	110	140	...	...	...
16′ "	...	...	85	105	135	165	...	...	...
18′ "	...	...	95	125	155	200	...	...	...
20′ "	...	...	100	130	190	210	...	...	...
25′ "	...	...	150	200	250	350	450	...	...
30′ "	...	...	...	275	350	450	600	...	...
35′ "	...	...	...	400	450	600	800	...	...
40′ "	...	...	...	...	625	850	1,000	...	...
45′ "	...	...	...	...	900	1,100	1,300	...	...
50′ "	...	...	...	...	1,150	1,350	1,600	...	...
55′ "	...	...	...	...	1,300	1,700	2,200	...	...
60′ "	...	...	...	...	1,700	2,200	2,400	...	...

When burglars tried to get into a grocery store in Pueblo, Col., recently, Nig., a bulldog left inside to guard the place, knocked the telephone from a table.

The telephone girl heard barks, notified the police, and they got there in time to prevent the burglary. The police think the upsetting of the telephone was accidental, but the grocer says the dog knows what it was doing.

What One Woman Thinks

By Sarah Elizabeth Brown

THERE won't be much use in my talking to you about the convention of the National Independent Association, because most of you were there and I wasn't. I have read the report of the convention and the resolution it passed, which was something of a surprise to me, because the resolution was or appears to be an absolute denial, whereas there must have been some foundation for the rumors that preceded the convention. Just between you and me, it is my personal opinion that the resolutions do not ring true and that the author of that historic document might have made it sound better by sticking more closely to the actual truth.

The resolutions of an independent convention are one thing, but the actions of the individual members of that convention are something else again. The very men who resolve to fight it out along the lines that have prevailed hitherto are usually prone to go right back home and do the contrary thing.

I have already been advised that Theodore Gary has sold his company to R. A. Guthrie and that the consideration was something like $70,000. The reason given for this transaction is that Mr. Gary found that his time would be wholly required by the investment company which bears his name. The Theodore Gary Investment Company was formed in 1907 and has a capital of $250,000. It acts as the fiscal agent for the various telephone companies of what is known as the "Gary System," embracing a great many plants with something like 25,000 telephones, representing an aggregate investment of four and a half million dollars or thereabouts. So it is only natural that Mr. Gary would want more time to give to this business which has been developed in a comparatively short time.

R. A. Guthrie, who becomes the controlling factor in the Macon system, was at one time editor of the Macon *Times*. He must be a pretty shrewd fellow, because it isn't usual that editors rise to the cashiership of a First National aBnk. At previous times I have told you my opinion of banks and bankers, and it is always a good sign to find that bankers will take over the telephone business and promise to give good service. There is this other thought, however: Bankers usually know a bargain when they see it and their training suggets quick turn-over of property, providing there is a profit in sight. The natural conclusion is that Mr. Guthrie might not hold on to the Macon system with the tenacity of a Gary. Time will tell us whether I am making a mistake in throwing out this hint.

* * *

I will surely be pardoned for bringing up the Nation convention this month, because it has been a topic of conversation across our table ever since Obediah returned from Chicago. He must have enjoyed the trip, because he told me "it done him good." He brought home a little souvenir of the festivities which I am going to ask you to reproduce, because it emphasizes in a way part of Obediah's extravagance. He tells me that he paid $6 for two tickets for the banquet; one that he expected to use himself and that he did use, and another for Ben Phelps. It seems that Ben forgot all about the banquet and went to a show, which left this extra ticket in Obediah's pocket. Of course, he has charged up the ticket to Ben, and I shall want you to send it back to me for it will become a souvenir of the occasion, which has been the subject of so much conversation.

I had heard a lot about the La Salle hotel prior to the convention. The management believes in advertising and it is evident that they confine themselves particularly to newpaper advertising. Because the banquet it served to the National Independent Telephone convention, from the best report I can get out of Obediah, was extremely punk. Obediah says that the banquet room was beautiful and that the service was good enough, but that the meal was a poor quality of the ordinary seventy-five-cent table d' hote thing that is served up in second grade restaurants. You know that a countryman hates to give up three dollars for a single meal. I am told that on Obediah's table there were four wilty rosebuds, an abundance of Apollinaris water, nine olives and plates for eight people. The waiters swept into the room at the signal of a bell, which Mr. Savage couldn't help taking a

BANQUET

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION

THURSDAY EVENING, FEBRUARY 9, 1911

SEVEN THIRTY

LA SALLE HOTEL

185 CHICAGO ADMIT ONE

crack at when he got to it. There were five oysters in as many shells and some of the best horseradish and paprika sauce that ever came to a table. It brought the tears to everybody's eyes who indulged. The menu said, "clear, green turtle," but it was such a new thing in soup that Obediah passed it up. There was some celery on the table, but not nearly enough for a hungry man, especially when he had to divide it with eight people. The "cassolette of crabmeat Maryland, *vol au vent financierre*," looked a whole lot like codfish, and it was served in a little vessel made of dough. Obediah says it was wholly out of the question to eat the vessel and that he made himself ridiculous in trying to break it. He did fuss with that filling, however.

After this very dainty little offering came what was put down on the bill as "Roast Jumbo Squab," and I guess it was a pretty bad squab at that. On the plate was a whole tomato that had the appearance of having been stepped on by somebody, and some scattering shreds of *"pommes julienne,"* which I guess were meant to be potatoes. There was a side dish of lettuce and tomatoes, which was offered as a salad, but it was a mighty skimpy affair, and by this time they were down to the cheese and coffee. Years and years ago

Obediah went back on some roquefort because years and years before it was presented to him it had gone back upon him, but he did wade into the camembert. He nearly broke his bridge on one of the crackers. The little dab of coffee he was served in the café cup was good as long as it lasted, but it didn't last long enough. After this had all been swept away, there was a tinfoil package containing two cigars of different brands and four cigarettes of different brands and a piece of Yucatan gum. And this was the meal that has given Obediah an ingrown grouch against ever attending another banquet of the National Independent Telephone Association, unless a price of fifty cents is put upon it, and somebody pays that.

* * *

Down in Kansas City the officials of the Home Telephone Company are already denying that that institution is owned by the American Telephone and Telegraph Company, in spite of the numerous indications in Kansas City that the Home Company has been sold or is about to be sold. One indication that something is doing is a new lease taken by the Missouri and Kansas Company on the Gates building at Penn street and Grand avenue. It is claimed that there is more space in the building than would be needed by the Bell Company of Missouri. It is alleged that this additional space could be used by the A. T. & T. Co. as headquarters for organizing a group of independent telephone companies in the west and southwest to co-operate with the big parent company, and some people take it as an indication that Kansas City will be a big center for future Bell activities. It is not denied that Mr. C. F. Gleed and J. J. Heim, presidents of the opposing companies in Kansas City, have been east together.

* * *

Did you ever hear of the Telephone, Telegraph and Cable Company of America? Sounds great, strung out like that, but it wasn't much after all. The concern was chartered in November, 1899, with an authorized capital of $30,000,000. Two years later the stock was scaled down to $9,000,000 by reducing the par of shares from $50 to $15. The outstanding stock was only partly paid for when receivers were appointed. Early this month John Jacob Astor, who held for himself and twenty-two others 22,000 shares on which $5 a share was due, was obliged to pay $110,000 in cash and relinquish all rights to any dividends that might eventually accrue to stockholders. If your memory is not fresh in these matters you may be able to recall that Charles W. Morse was responsible for the receivership and that Morse is now serving time in the federal prison at Atlanta. When I think of telephone companies whose capital runs into the millions I can't help believing that the independents have the best of the proposition all the time. If we can agree among ourselves, the problem with our subscribers becomes the lesser. Interconnection among ourselves first, and with our competitors second—provided we can have a hand in making the agreements.

* * *

Morgan, Morgan, Morgan—everywhere. And him in Egypt. Say, brothers, how can a man be such a bugaboo to an industry of our very own that runs into $400,000,000, or something like that? Who's running this independent business, I wonder? Wall street may think its present activities count for something, but I don't. Back to the lines!

Well, the court has finally granted that receivership for the Continental Company, naming Frank P. McDermott. Charles E. Wilson of the Keystone is slated as an associate for Mr. McDermott.

* * *

The old U. S. I.—United States Independent Telephone Company—is still floundering about in the courts. Everywhere it goes it is consistently after the same old thing—endeavoring to upset Commissioner O'Brien's refusal to recognize the franchise rights of the Mercantile Electric Company to build a competing system in New York. You will probably recall that the franchise of the Mercantile Company was capitalized by the U. S. I. at $40,000,000. Did you ever stop to think that the telephone business is supporting a lot of lawyers? Getting to be something of a proposition when you can carry that big load.

* * *

Delegates to the National convention were given a guide to Chicago that told them where to buy their poles. This guide also told 'em where an automobile was hitched in which they might ride to a pole yard. As a matter of fact, automobiles were about as thick as delegates, and Ben Phelps says he rode in as many of them as he could find. Ben believes in seeing things in the making, but he said that his notion of nothing to see in Chicago was a pole yard. Poles have no charm for Ben unless they are standing up with as many cross-arms and pins as they will support with the load of wires. A great deal of the matter in this guide book that Obediah brought home is devoted to the parks, showing summer views. A lot of it suggests to the city visitor the benefits of a ride on the lake. It is evident that the convention was not postponed long enough to make it an up-to-the minute advertisement. It had a lot to say about what things cost, but it was silent about what you were supposed to get for your money.

* * *

Herman C. Stifel has given up his notion to see the books of the New Long Distance Telephone Company, which is another evidence that wire men change their minds. You know the rest of it. Well, that clears the docket.

* * *

Kansas City Home Telephone Company stock is selling as high as $115 and its bonds up to $94. I simply set this down as a record that independent telephone proprietors represent investments when they are properly handled.

* * *

Well, they slipped another one across at Council Bluffs, all right. A check for $125,000 came from New York and cleared through the First National Bank of Omaha's eastern suburb. The stockholders formed a line with their stock in their hands and cashed it in at the paying teller's window. Nobody seemed to know where the money came from, but there are a number who know where it is now. Who bought Council Bluffs? Only one guess.

* * *

The old press bureau—the iniquitous—is at it again, and I want to enter a protest. This Council Bluffs affair gets on my nerves. I have one great big buff cochin hen who lays the little egg every time and nearly goes into spasms with her big noise. She resembles the press work of the Bell press bureau—mostly bluff. In connection with this newest transfer in Iowa, Casper E. Yost of the Nebraska Bell is quoted

as having said: "We have secured a substantial interest in the Council Bluffs independent company." That is the way Mr. Yost breaks the news, but in the same story, given to the identical same reporter at the time, this insidious crack is tossed in for good measure: "Director Frank H. Woods of the Independent Telephone Association has been in New York 'dickering,' it is said, with the interests that would merge the two companies." This is like the uncalled for clatter of my old hen. The National convention held at Chicago, early this month, developed some facts, among which none were more convincing than that the Bell company invited the conference with independent operators. The first meeting was held in the Blackstone hotel in Chicago and Theodore N. Vail journeyed all the way from Lyndon, Vermont, to attend. Now, isn't it discourteous, to say the least, to rope in that Mr. Woods is "dickering"?

Obediah has told me that nearly all of the old has-beens were cluttering up the corridors of the La Salle during the convention. He met Walter Doolittle, who is running some kind of a grave-yard supply house; Harold Stroud, who is with the Subway Construction Company; Frank Sapp, doing some advertising stunt down east; Ike Kusel, in the railway supply business; George Conover, gentleman of leisure; Billy Crumb, fatter than ever and selling most of Georgia; Henry Shafer, trying to sell carburetters for the solicitors of independent exchanges, and a lot of others. And he missed a lot of them. Marcy Berger couldn't be present owing to sickness; George Briggs and Frank Jones have so much to do they missed the show; Al Rousseau wasn't there; Al Stromberg was in Cuba, and Louie Sands, a famous old-timer, didn't show up; but there were many exhibitors and from all over the country.

The Telephone in Business Getting

2. Canvassing for Electric Light. By T. I. Jones*

THE purpose of this paper is to describe a method of increasing revenue from existing customers of an electric light and power company and of obtaining new customers through the creation of first interest by the use of the telephone. The method is that devised by the sales department of the Edison Electric Illuminating Company of Brooklyn, beginning June 10, 1910.

BASIS OF PLAN.

It is generally acknowledged that less than 20 per cent of the calls made by an agent on prospective customers result in the closing of a contract. This is in some cases due to the lack of money of the person approached. The exterior appearance of a store or house or of the person who dwells therein is not always an indication of prosperity.

In canvassing telephone users we start at once with a preferred list of people who can at least afford to pay $2.50 per month for telephone service (for $30.00 is the minimum annual rate for a 600 message residence contract in Brooklyn). We assume that if a person is sufficiently well off to afford $2.50 per month for telephone service, he certainly could afford to pay about the same price for electric light and power. As a matter of fact the average small residence consumer's bill for electric lighting at our present rates and lamp efficiency is less than $3.00 per month.

This, briefly, is the theory which the writer would have you bear in mind while considering the value of a telephone user as a prospect for the lighting solicitor.

APPROACHING THE CUSTOMER.

If we agree that the telephone user in a community represents a good type of electric light prospect the next question is how and when shall we approach him? Surely there is no general sales agent who has not had reports from his salesman that Mr. So-and-So is not in—cannot be seen—has an important engagement, etc., this resulting in a large number of calls before the first word is spoken. On the other hand, have you ever called many times on the telephone and except for a report of "busy" or "don't answer" been unsuccessful in reaching the party called for? Have you not often answered a call on the telephone both at your home and at your office on a subject which you would not have discussed if the call had been made in person?

With these considerations before us why should we not call upon the telephone subscriber through the medium of his telephone?

EXPENSE INVOLVED.

In the foregoing only the ethical question of approaching a customer by telephone instead of in person has been considered. Nothing as yet has been said regarding the expense involved. From this standpoint the call by telephone has very much in its favor. How many salesmen average fifty calls a day, for example? Yet this number can be easily made within four hours by telephone, the expense being the message rate under the company contract, amounting to approximately three cents a call in the larger cities, the loss of time of the agent between calls and the cost of transportation being entirely saved.

MAKING A CALLING LIST.

The preparation of a list of prospects involves some clerical work. The names in the telephone directory, so far as they apply to electric light canvass, may be separated into three classes:

(a) Present electric light consumers.

(b) Non-electric light consumers located on the lines of the electric lighting company.

(c) Non-electric light consumers located off the lines of the electric lighting company and requiring an extension of the mains to serve them.

These three divisions may be further divided into business and residence prospects. It is obvious that a different method of handling each class of prospect is required.

THE RESIDENCE CAMPAIGN.

In considering the residence prospect the first question is what time of the day to call? In Brooklyn (and it is hoped the same conditions hold true in

*Paper read at the twenty-sixth annual meeting of the Association of Edison Illuminating Companies.

other cities) when a salesman calls upon a housewife she usually expresses an intention to consult her husband before discussing the subject. It would, therefore, seem best that the call be made when the head of the house is at home and at that period when he is likely to be in a receptive mood—obviously not before he has had his dinner nor too soon after. In short, the call should be made at a reasonable interval after dinner. The time, too, should vary with the season of the year. In Brooklyn we have chosen from 8 to 9 p. m. as the most desirable and have omitted Saturdays, Sundays and holidays, thus far devoting two or three nights a week to the canvass.

THE RESIDENCE LIST.

The start of the residence campaign is, of course, the making of the list of names, locations and telephone numbers. We take the ordinary telephone directory, first going through the letters in sequence as they occur, checking those who are present customers. As soon as each page in the directory is checked the detail is written on a card, a copy of which is shown here.

It will be noted that this card gives the name, address, whether present customer or not, business or residence, whether on or off the line, the telephone number, and provides separate columns showing the dates telephone calls are made, the person spoken with the salesman calling, and the result of the conversation. After making this card out covering the present customer, the name is crossed off the telephone directory list and the sheet handed to a clerk having in front of him a map of the company's lines. This clerk notes on the telephone list beside each name whether the house is on or off the line. The telephone sheet is then sent back to the card clerk, who makes out the proper card, identical in all respects to the "present customer" card except that the word "no" is placed after the word "customer" and a line drawn through the word "on" or "off," according to the position of the telephone customer's house with respect to the electric lighting company's lines. These three sets of cards, present customers and non-customers on and off the line, are then sent to the district managers in territory indicated by the addresses on the cards.

TELEPHONE CANVASS.

Name ..... Present Customer? .....

Address ..... On / Off Line .....

Business ..... Telephone No. .....

CALLS.

Date. Interviewed. Result of Conversation. Called by.

.....

.....

.....

.....

.....

.....

403@38.145 .....

THE CALLING WORK.

In Brooklyn we divide the city into three districts, each under a district manager—the district manager sub-divides his territory into local areas each covered by a salesman who is responsible for the development of his particular field.

On receipt of the cards by the district manager, they are sorted out and given to the salesmen concerned. The district manager then designates the particular nights in the week the various salesmen

THE TELEPHONE CONVERSATION.

Approaching a man by telephone should be done as tactfully as soliciting a person—for example, in nine cases out of ten if an indiscreet salesman should call up a non-user of electric light on a hot summer evening with the query, "Do you want any electric light?" he would probably receive a curt reply. In Brooklyn we have indicated to our salesmen the exact conversation we desire used. For example, in approaching a customer who has no electric light service, the local salesman endeavors to include the name of a recent customer who has been added to our lines and who is a neighbor of the person called, and the conversation begins something as follows:

"This is Mr. ———, local representative of the Edison Company. We are making a canvass of your street, have recently added Mr. ——— to our lines, and desire to know whether you care to consider electric service similar to that of your neighbor."

This form of opening conversation is used with people on the line who are not customers.

To non-customers off the line the conversation begins as before, except that the local salesman states that we have had a number of requests to extend our lines along the street noted and would like to know whether the person called would be interested in joining with the others in a request to have the company extend its lines to give them service.

So much for the non-user of electric light. With the present customer a little different tact is taken, the conversation beginning as follows:

"This is Mr. ———, the local representative of the Edison Company. We are making a telephone inquiry among our customers to ascertain whether the service is satisfactory in every respect, and we would like to receive any comment that you may care to make."

As a rule the answer to the above inquiry is satisfactory. The agent then continues the conversation, having in mind some particular electrical appliance, according to the time of the year. For example, the conversation continues as follows:

"We are glad to hear the service is satisfactory. We have recently purchased a stock of new electric irons (here any other appliance can be named). Would you care to have us send you one on a thirty-day trial?"

This frequently results in the placing of some electrical appliance and the customer feels that the company is taking an interest in his service.

The natural question that immediately arises on reading the above is how the customer receives these telephone inquiries. You may be surprised to know that in over 500 calls we have made to present and prospective electric light users, we have not received one discourteous reply or abusive criticism.

RESULTS.

Here are the reports of two separate district managers on the results of one of their night's work:

Total Calls Made	61
No answer or disconnected	29
Prospects for September 1	1
Immediate prospects	12
Will not consider	18
Total Calls	68
Parties' telephone disconnected, either temporarily or permanently	10
Out or would not answer	28
Would not consider on account of expense; tenants only or not interested	14
Parties interested; requests to call in Fall, about September 1	5
Appointments or requests to call immediately	11

The large number not answering is probably due to the extremely hot night driving the people out of doors.

You may be interested in knowing some of the detail of the answers we have received. Here are some specific replies to our telephone inquiries:

(1) Interested—requested agent to call.
(2) Interested—call about August 15.
(3) Mr. ——— not at home—Mrs. ——— requested that we call again.
(4) Mr. ——— stated that he had not given the matter any thought whatever, but would talk it over with his family and let us know later.
(5) Mr. ——— was not in, but Dr. ———, the Druggist, who is a customer of the Company at this address, said he would talk to Mr. ——— about the matter and do all he could to get him to install lights upstairs, and requested that I have an agent call.
(6) Mr. ——— was not at home. Mrs. ——— stated they did not own house and would not consider.
(7) Mr. ——— stated he did not own house, but would use service if landlord wired. Requested to have agent call at his New York office, —— Street, any morning after July 4.
(8) Mr. ——— not at home. Sister stated that her father owned the house and that she did not think they would do anything, as the neighborhood was getting to be very poor. Would take the matter up with her brother, who might consider the matter if agent called to explain details.

(a) Telephone number changed. Mr. ———, at No. ——— Avenue. Using Edison service—no complaint to make; well satisfied; has no trouble getting new lamps; desires nothing additional at present; invited customer to office to see washing machine, fans and heating appliances.
(b) Not in; may be interested; call in a day or two between 9 and 10.
(c) Called this party twice; boy answered each time; called him last night; states he had a light a year ago; too expensive; don't want it; however, is willing to have agent call June 28, 3:30 p. m.
(d) Not interested in having house wired; may want power later in Fort Hamilton; will call at office next week or make appointment.
(e) Does not own house and will not consider light.
(f) Going away—will not wire now. However, is willing to have agent call with contractor and contractor to submit estimate.
(g) Not interested, but will be glad to have agent interview him any evening between 5 and 8.

It should be noted in considering the above reports that the main object the telephone canvass seeks to do is to interest the party called. We have additional data along this line, but the above will be sufficient to indicate the general initial results.

THE BUSINESS OR STORE CAMPAIGN.

We have not yet carried the store campaign far enough to present any data as to its value.

The telephone canvass was established primarily for residence use, largely because of the difficulty of getting in touch with the head of the house in the day time and the undesirability of approaching a business man at his office during business hours regarding service at his home.

CONCLUSION.

We have been carrying on this campaign less than three months, yet from the results secured in this short time we are satisfied that the telephone canvass will prove an effective method of securing business. We have already closed a number of contracts because of it and have awakened a very considerable interest among many prospects which is sure to eventually result in an increased business. It will be noted, from the reports submitted, that of the total telephone conversations, over thirty per cent have resulted in requests for immediate call, and the indications are that at least one-third of these calls result in contracts closed.

Sometimes indirect results are secured. Through residence calls we have developed two very good prospects which are likely to result in the closing down of independent power plants. The calling on present customers has been particularly satisfactory, not only in adding appliances or additional lighting to our circuits, but in bringing up and adjusting numerous little misunderstandings regarding lamps supplied, billing methods, etc., thus increasing the number of satisfied customers.

Undoubtedly many modifications to this plan of telephone canvassing will suggest themselves, and it is with the hope that the ideas here presented will be freely discussed that this paper is presented.

Oklahoma Association Meets

The Oklahoma Telephone Association, which met at the Lee-Huchins hotel in Oklahoma City February 14, elected for the ensuing year the following officers: R. S. Goff, of the Sulphur Telephone Company, president; I. H. Strickland, of the Stonewall Telephone Company, vice-president; Horace Truman, of the Geary Telephone Company, secretary-treasurer

The executive committee: J. W. Wilson, of the Pioneer Telephone & Telegraph Company; E. A. Smith, of the Norman Telephone Company; L. F. Gilger, of the Central Telephone Company of Fairview; and J. W. Steele, of the Kingfisher Telephone Company.

A committee on special legislation: Humphrey Sullivan, of the Pioneer Telephone & Telegraph Company; W. Scott Yates, of the McCloud Telephone Company, and L. T. Hines, of the Purcell Telephone Company. This committee received instructions on legislation which affects the 400 telephone companies of the state.

Committee on arrangement of next meeting, which will be held in Oklahoma City the second Tuesday in August; L. A. Smith, Horace Truman and Humphrey Sullivan.

California Pole-Line Bill

A bill introduced in the California legislature proposes radical changes in the stringing of wires in that state. The bill requires a distance of 13 inches between the pole and a wire, making a space of 26 inches in which the lineman will be free to work. Cable lines are to be strung on cross arms, instead of along the poles on brackets, and laterals from underground conduits to the cross arms of poles must be incased in wooden casing of $1\frac{1}{2}$ inch thickness. A representative of the Electrical Workers' Union of San Francisco during the hearing on the bill explained that a space of 26 inches for the lineman to work in at the cross arms of the poles is necessary for his safety, as in that space he could shift about and would not be obliged to crawl around and come in contact with the high tension wires on the poles. Yellow paint for the cross arms carrying high power wires was also advocated to warn the lineman of the danger. Mr. John A. Britton, of the California Gas & Electric Corporation, asked that the law be made to apply to lines to be constructed hereafter, giving the companies four years at least to change the existing lines to conform to the new requirements.

Digest of Foreign Telephone Literature

Translated for Our Readers

SOUND DAMPENER FOR OVERHEAD WIRES.

A NEW sound dampener for overhead wires has been invented by P. Schomer in Beuel, Germany. The dampener is a cylindrical concrete piece, which has a slit running through the entire length to hold the telephone wire. After the wire has been fitted into this slit, it is filled with concrete, making a homogenous body surrounding the wire on all sides, and eliminating all wire vibrations at that point. The vibrations of the wire can reach the pole only if the vibrations are stronger than the cohesive and adhesive forces of the concrete. But as the strength of the vibrations depends on the thickness of the wire, the weight and mass of the concrete dampener is also chosen in proportion to this wire thickness and to the strength of the current. Schomer makes his dampeners for telephone wires in two sizes: one for 1.5 mm. wire, weighing 550 pounds, and one for long distance heavy wires, weighing 770 pounds.—*Elektrotechnische Zeitschrift.*

TELEPHONING FROM A MOVING MINE HOIST CAGE.

It is often of great importance in mines to telephone or signal from great depths to the engineer at the surface, and aside from electric signals, the telephone is best for this service. A contact roller is used for telephone service. Both the electric signal and the telephone are operated by pulling a lever attached to a spring in the mine hoist and closing a circuit with the alarm or engine room telephone. The contact roller equipped for telephone service has a hard rubber disc and two sub-partitions, which are insulated from each other. Above the contact roller are spring brushes. In telephoning the same operations are gone through as in signaling. The releasing lever is released, the connection of the contact roller with its circuits is established, and the telephone is ready for service. Of course if telephoning is done from the stationary hoist and not from the moving cage, it is simpler to connect the telephone wire from the hoist direct with the wires, so that the contact roller arrangement becomes unnecessary.—*Glückauf.*

MECHANICAL GENERATION OF ELECTRIC WAVES FOR WIRELESS TELEGRAPHY AND TELEPHONY.

Wireless telegraphy and telephony require current up to 30,000 periods per second, which is equal to a wave length of about 33,000 feet. It is, however, desirable to have frequencies of 100,000 periods and more, to which requirement must be added that of steadiness for the wireless telephone service. For years tests have been made to reproduce electric waves without the use of sparks and arcs, direct from a generator whose capacity, like that of a dynamo, can be increased at will. Alternating current dynamos do not give uniformly good results. The author worked out a new process, which has been practically proved to be sound. In Fig. 1, S is the stator, R is the rotor or armature of a generator built like an a.c. induction motor. Direct current is sent into S and R simultaneously from battery B, which is protected against alternating currents by a choking coil D. The rotor rotates with an angular velocity w (reduced to two-pole winding). In Fig. 2, the rotor and stator are separated by condensers C, which only allow alternating current to pass through, so that the a.c. flows only in S. We get then R-currents of frequency i, which correspond in this respect to the rotation. These currents flow over C into the stator winding and cause a rotating field, which rotates with a velocity w. R and S act together in such a way that the rotating field rotates backward and gets an angular velocity $2w$ in respect to the rotor. In R we get currents of frequency $2f$, which flow again into the stator and generate currents of $3f$ frequency, etc. Fig. 2 shows the diagram as used in actual practice. Rotor and stator have single phase windings.

Rotor R is short-circuited within itself, while in the stator through the large condenser C, a short circuit from alternating current is made. If S is excited with direct current, we get currents of frequency f without R. R is now considered the primary part and the rotating field, generated by the rotor current, is separated into rotating field components, in an opposite direction from that of the rotor. One of these components is stationary and has the rotor reaction to the stator field generated by direct current. The second component rotates with a velocity of $2w$ (own velocity plus rotor velocity) and generates currents of $2f$

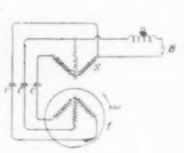


Fig. 1.

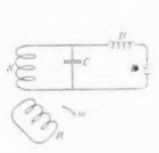


Fig. 2.

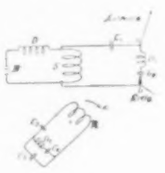


Fig. 3.

frequency in the stator. These are again subdivided into active and reaction components and yield $3f$ frequency current, etc. In this arrangement, the current or mass of electrical energy is conducted from the primary to the secondary part by means of induction, to obtain high frequencies, just the opposite arrangement from that in Fig. 1.

Another peculiarity of this system is that rotor and stator become primary parts in alternate order. If care is taken so that the unused, low frequencies all flow into real short circuits, and only the frequency which is to be used is conducted to the antenna, we get within the generator a transformation of low frequencies to high frequencies with a high degree of efficiency. The energy up to a certain limit increases with the increasing frequency, since with each increase of frequency, new mechanical energy changes into electrical energy. Without the short circuit for the dead frequencies, the current would become weaker and weaker as the number of periods increased, and the efficiency would approach zero. The generator has the advantage that the active components of frequency, n-f, are almost eliminated by the reaction components of frequency (n plus 1) so that only the last frequency, which is also the highest one, remains at its full strength, and is the only one influencing the iron-

losses. "Real short circuit" in a.c. is not a mere connection of wires, but a circuit through a condenser, which also eliminates the self induction phenomenon within the generator. Fig. 3 shows the action best of all, although in practice it is even simpler than in theory. Suppose we wish to get four times the frequency of the capacity of the ordinary generator. Stator *S* is excited with direct current over the choking coil *D*. Rotor currents of *f* number of periods flow on a set path over *R-C3 D2-C4-R*. Condenser *C3* is of such strength that it eliminates the self induction of *R*, while *D2* and *C4* at *f* periods are exactly in resonance. The *2f* period current caused in the stator, flows over *C*, *D* and *C2*. *C2* and *D* are arranged for oscillations harmonizing with *2f*. Rotor currents of *3f* frequency flow by path of *C5*, which is also in harmony with the rest of the operation. The *4f* currents are the ones to be used and these can be taken off between points *a* and *b*. The first generator for this work has been in practice since April, 1910, in the Eberswalde wireless telegraph and telephone station, and has given good service. If the generator generates with a 33,000-foot wave length we get an efficiency of 12.5 k. w. and with 18,000-foot wave length an efficiency of 8 to 10 k. w. But generators can be constructed to yield 60 to 80 k. w. with a wave length of 10,000 feet. The efficiency of a 33,000-foot wave length is about 80 per cent. A special advantage of this generator is, that a large number of frequencies can be obtained by a simple change of wiring and that any gradation of wave length can be made.—*Elektrotechnische Zeitschrift.*

SIMULTANEOUS TELEGRAPH AND TELEPHONE SERVICE IN AUSTRIA.

After long tests with various simultaneous services, the Austrian government has at last adopted the "Cailho" service for the official government telephone and telegraph lines. The three types of systems are here briefly described.

There are two end station types and on intermediate station type. Fig. 1 shows the system used in the main telephone exchange in Vienna. The wires 1-2, coming from the transimssion system of wires, are distributed in jack boxes *KlK*, and make direct connections with all lines. They lead to the interurban jack box *InKl* at the exchange as also to the simultaneous jacks *SKl* in a special jack box for the telegraph signal call system. The interurban jack makes the connections of any wire in the local net work, the simultaneous jack makes the telegraph connections. Here begins the difference from the interurban telephone system. Rectified and direct current comes on the two wires *1-2* for telegraph correspondence. The current flows over the jack terminals of the simultaneous jacks *SKl* and over the points of the corresponding plug into the ends of the simultaneous spools *SS*. It flows then through this, so as not to cause a magnetic field, and

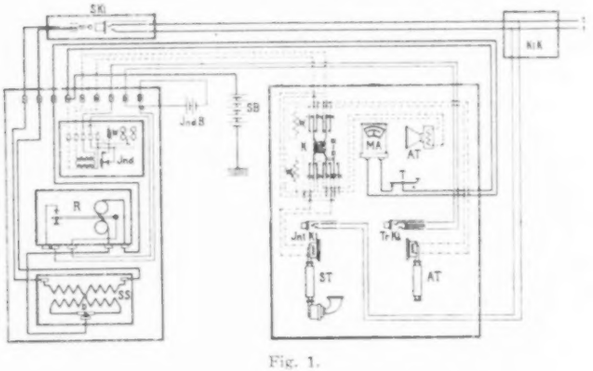


Fig. 1.

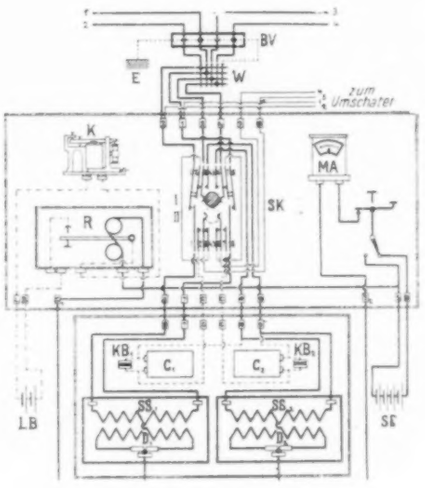


Fig. 2.

unites again at plug clamp *D*. The total current now takes its path over spools or coils of relay *R* to clamp *3*, over milliameter *MA*, over the back contact and the pivoting point of the sender *T* to clamp *A*, and from there over the simultaneous battery *SB* to earth. The battery is in permanent closed circuit. The armature of relay *R* is normally attracted. When the line circuit is broken, it is repelled and closes the circuit of induction coil battery *InB*, over clamp *o*, over the working contact and armature of relays, over the back contact and armature of the induction coil *Ind*, over the primary winding of the same to clamp *7*, the four terminals of the separating jack *Trkl*, and clamp *8*, back to battery. Parallel to this winding, that is the contact breaking piece of the induction coil, is a resistance wire *w* and a small resistance *L*, consisting of four small lamps. The broken direct current circuit induces in the secondary coil of the induction coil an electromotive force so that an alternating current goes over clamp *5*, over the upper terminals *5-4* of the rocker or rocking key, its lower terminals *5-4*, over those of the telephone *AT*, the lower terminals *3-2* of the rocking key, and the upper terminals *3-2* to clamp *6* and then back to the coil which transmits into the "Avisophone" the telegraphic dots and dashes by means of longer or shorter sounds audible to the operator. The separating jack *TrKl* and serves to interrupt the action of the induction coil through the introduction of an insulating plug in case of trouble.

The wiring diagram for the intermediate station is shown in Fig. 2. From the overhead wire, the lines *1-2* and *3-4* enter the exchange and pass over the lightning protectors and protection *BV* to alternator *W*. The currents on line *1-2*, equal in both branches, flow to clamps *1-2*, over two terminals *8-1* to lower terminals *8-1* and over pairs of terminals *7-7* and *8-8* to the end of simultaneous coil *SS*. After currents have passed through both branches without any inductive resistance, they unite at plug terminals *D*. From here

the total current takes its path to terminal *S*, over relay coils to terminal *S* and to simultaneous battery *SB*, from this terminal *B* and over switch, pivoting point and back contact of sender *T*, over the milliameter and terminal S_2 to plug terminal D_2. Here current again divides into two equal branches. These two branhes flow through simultaneous coils SS_2, without finding inductive resistance, go over a pair of terminals *9* and *10* to upper rocker, to terminals *4-3* or *5-6*, to terminal *3* and *4*, and from these over to the correspondingly plugged segments of alternator *W* and over safety cut outs and fusses *BV* into current wires *3* and *4*. The closed circuit exists continuously and simultaneously over the entire installation and is broken by pressing down sender at back contact. Consequently the armature of the relay is repelled, closes local circuit of local battery *LB* over terminal *L*, the sounder *K*, relay armature and working contact to terminal *B*, or back to local battery, whereby the sender gives off the telegraphic message sent. The telephone currents on lines *1-2* take their path over lines *1-2*, to connect station or to terminals *6-5* over rocking key springs *3-2* and *6-7* over condensers *C* and C_2 to terminals *10-9* and then to outgoing lines *3-4*.

The third type illustrates end station with sender system, seen in Fig. 3. They work like the others. The sender in the two positions *1* and *2* makes the connecting or cutting off of simultaneous operation.

Most of the instruments are well known. The con-

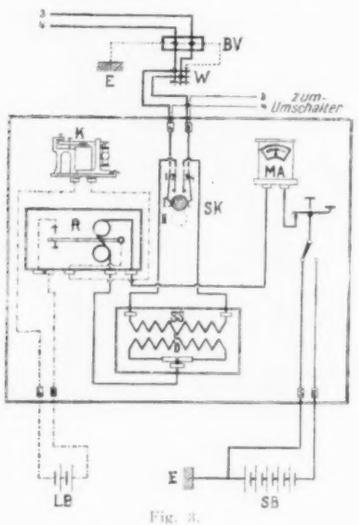


Fig. 3.

struction of the simultaneous coil might be of interest. The core of this coil is made of a bundle of wires of about 7500-0.32 mm. thin, soft iron wires. Over this core two wooden spools are fitted which are each wound with 6,200 windings of a silk covered 0.22 mm. copper wire. The rest of coil has the usual form.

The correspondence of central with parties is done by telephone, all other official communication by telegraph. In the intermediate station, the simultaneous-telegraph line must never be closed, the telephone line only at times. If system works without intermediate station, then the two end stations work alternately. Telegraphic communication comes previous to telephone conversation. If a central has no call, when its turn comes, it calls the other end station, and gives the "clear" signal. If the opposite station has no calls either, it is called up and after response, a question mark is sent, to which reply will be either "busy" or "clear." If there are any calls, the preceding telegraph message add either O (official), or B (business), or I (important), call being given twice in advance. If several stations call up and are in line, they work either alternately, as just described, or make their calls to one collecting central. This collecting station will then call the various lines to answer the calls. In the main, the idea is to save time and trouble. Vienna calls Grammot, asking the latter to bring a certain subscriber to the telephone for a Vienna call. Each kind of calls has certain symbols, as already stated. All preliminary calls, *i. e.*, all requests for calling a party, are made by telegraph. The replies from stations are also sent by telegraph, and then when both parties are at the wires, telephone connection is made.

The system works well and gives great satisfaction. In case the simultaneous service ever gets out of order, so that telegraph calls disturb telephone conversation, this combined system is switched off and simple telephone service used.—*Elektrotechnik u. Maschmenbau.*

A NEW MERCURY ARC RECTIFIER.

A new mercury arc rectifier for transforming high voltage alternating current to low voltage direct current, and to charge storage batteries in telephone exchange power plants, has several advantages. The vacuum vessel in this case is a steel pipe about seven inches in diameter, which is closed at the top and bottom by flanged circular discs. The packing is asbestos and mercury, which has proved very efficient and preserved a perfect vacuum. The feeder current is admitted through the upper disc at the anode, while the lower disc is used to hold the liquid cathode, and at the same time carries two auxiliary anodes. A concentric iron cooling jacket envelops the cylinder, the circulating cooling liquid being between the two shells. The cathode has a peculiar shape, and eliminates the fluctuations in voltage which are so common in most rectifiers. To get this effect, a portion of mercury is shut off by means of a thin firebrick pipe, inside of which is the arc, which is thus forced to ascend to the anode. The movable starting anode is operated by a solenoid, which is fastened to the outside of the cylinder. The auxiliary anode excites the cathode by means of a small continuous burning auxiliary arc of a few amperes current. When the action begins, the starting anode dips into the cut-off part of the cathode surface, whereupon the constant exciting arc operates. After the latter is started, the starting anode is cut off automatically. To rectify all current phases equally, valves must be placed into each alternating current system. In all cases the exciting arc must be fed from a small battery or by alternating current. Any strength current from 0 to maximum can be transformed without necessitating corresponding changes in the rectifier. In these steel cylinders, a small vacuum pump can renew vacuum without any interruption of service or other extra expense. When the rectifiers are used to charge storage batteries it is best to connect in circuit some sort of voltage regulator.—*Elektrotechnische Zeitschrift.*

The number of telephone utilities reporting to the Wisconsin Commission last year was 506, a decrease of twenty-three over the preceding year. This latter decrease was due primarily to the exclusion of certain private mutual telephone lines previously listed as public utilities.

Long Distance Telephony in America

By John J. Carty*

THE present state of the art with regard to long-distance telephony in the United States involves the use of two gauges of copper open wire toll lines—namely, No. 12 N. B. S. G., weighing 173 pounds per wire mile, and No. 8 B. W. G., weighing 435 pounds per wire-mile, and the use of underground and aerial toll cables with conductors varying in size from No. 16 B. & S., 42 pounds per wire-mile to No. 13 B. & S., 83 pounds per wire-mile, paper-insulated twisted pairs. The open wire circuits are both loaded and non-loaded, and the non-loaded circuits are frequently used in conjunction with telephone repeaters, both of the test board and cord circuit type. The cable circuits used in connection with long-distance telephony are invariably loaded.

In addition to the use of physical circuits there is a great deal of phantoming of non-loaded open wire toll lines. Cable circuits are phantomed to but a small extent, however.

In addition to the foregoing, which are in actual commercial use, the development at present taking place in connection with long-distance transmission, contemplates the use of larger gauge loaded cable circuits arranged for phantoming and the phantom working of loaded open wire toll lines. These points are taken up under the separate headings below.

OPEN WIRE TOLL LINES.

At the present time the standard of transmission aimed at for long-distance work is the equivalent of about 850 miles of No. 8 B. W. G. copper circuit (about 30 miles of No. 19 gauge cable.) The exact distances for which it is permissible to use the different classes of constructions depend to a considerable extent on the terminal conditions, that is the amount of underground toll entering cable and the uses to which the circuit is to be put; for example, whether it is largely for terminating business or is to be used mainly in connection with other circuits. The following table shows the relative transmission efficiencies of the different classes of non-loaded and loaded circuits at present employed:

Open wire circuit.	Miles equivalent to 1 mile No. 19 B. and S. cable (0.054 mf.).	Relative efficiency.
No. 12 N.B.S.G. (2.64 mm.) non-loaded	12.8	1.00
No. 12 N.B.S.G. (2.64 mm.) loaded	30.2	2.36
No. 8 B.W.G. (4.2 mm.) non-loaded	29.0	2.26
No. 8 B.W.G. (4.2 mm.) loaded	67.0	5.23

In general the No. 12 N. B. S. G. circuits are used for the short haul toll connections or as feeders for the long haul toll circuits, that is for connecting the terminal points to toll centers which have long haul facilities. The No. 12 N. B. S. G. loaded circuits and the No. 8 B. W. G. non-loaded circuits are used for long haul toll lines. As the above table shows, these two circuits have approximately the same transmission efficiency, and the principal reason why there are any non-loaded No. 8 B. W. G. circuits in the plant at the present time is due to the fact that, in the days before it was feasible to load open wire circuits, the No. 8 B. W. G. wires were universally used for long toll lines. Owing to the inherent characteristics of loaded lines the loading of large gauge aerial circuits was not made practicable until very recently. As fast as the present plans can be carried out all of the No. 8 B. W. G. circuits now in the plant, and certain other circuits which will be required to take care of the long-distance traffic, are to be loaded. This new loading contemplates the arrangement of the circuits for phantom working. When this is completed the loaded No. 8 gauge circuits, both physical and phantom, will constitute what might be termed "extra long haul" circuits.

AERIAL LOADING.

At the present time there are about 52,000 miles of loaded No. 12 N. B. S. G. circuit in the United States, and about 1,000 miles of No. 8 B. W. G. loaded circuit. There are at present under construction, or intended for completion by January 1, 1911, about 17,000 miles No. 12 N. B. S. G. loaded circuit, and about 13,000 miles of No. 8 B. W. G. loaded circuit. Of this latter about 3,800 miles, namely, four circuits from New York to Chicago—will be arranged for phantom working.

The efficiency of these two phantom circuits from New York to Chicago is expected to be substantially greater than the physical circuits of which they are composed. Either of these two phantom circuits may be connected at Chicago to a pair of loaded No. 8 B. W. G. wires extending from Chicago to Omaha. At Omaha these two wires may be connected to a phantom circuit made up of four loaded No. 8 B. W. G. wires, now being constructed between Omaha and Denver. Over this combination of circuits it is expected that we shall be able to get a fairly good talk between New York City and Denver, Colorado, and that, by means of this and similar combinations of circuits, the value of the transmission obtained between New York and the far wsetern cities will be greatly increased. Over these circuits—or over sections of them—it is proposed to operate in the standard manner each wire for the purpose of duplex telegraphy which can be carried on over these wires while they are being used for telephone purposes. Thus we may have going on at the same time two independent and non-interfering telephonic conversations between New York and Chicago, also two independent and non-interfering telephonic conversations between Omaha and Denver. In addition to this, a third conversation may take place—at the same time and over the same wires—between Denver and New York. While all of these telephonic conversations are taking place, eight telegraphic messages may simultaneously be sent over these circuits, none interfering with the others nor with the telephone transmission.

Some idea of the economic importance of this loading and phantom work may be gained when I state that the re-arrangement of the circuits on the new plan between New York and Chicago is being accomplished at a cost of $110,000. The improvement in efficiency

*Paper read at the second international conference of European Telephone and Telegraph Administrations, Paris.

in the transmission of speech thereby obtained and the additional improved circuit which phantoming gives to us would cost $1,600,000 if obtained in the ordinary way.

With the loading coils and lightning arresters as now constructed, there is very little trouble due to the failure of the loading coils, and practically no trouble due to low insulation in the arresters. These latter are also constructed in such a manner that there is practically no maintenance on them.

In the early attempts to load serial circuits one of the chief difficulties arose from inability to protect the loading coils from lightning with an arrester which did not require an excessive amount of attention, and it was largely for this reason that the early attempts at aerial loading were a failure.

At the present time the chief trouble on loaded circuits has been occasioned by low insulation due to leakage at the bridling points. This has been corrected by the adoption of the bridle wire electrose insulator, which insures a break in the conducting path along the wet bridle wire.

PHANTOMING.

The phantoming of non-loaded circuits involves the use of phantom repeating coils on the component side circuits. These coils necessarily introduce a certain amount of transmission loss so that the efficiency of the side circuits is slightly reduced. The phantom circuit produced is, however, considered more efficient than the original side circuits, and where phantoming is adopted in the toll plant it is usual to arrange the traffic so that the long haul connections will be put up on the phantom and the shorter haul connections on the side circuits.

LOADED PHANTOMS.

By properly arranging the windings on the loading coil cores, by observing extraordinary precautions in the manufacture and by constructing special coils arranged for four sets of windings, it is possible to phantom loaded circuits and to load the phantom thus produced. The impairment in the efficiency of the loading side circuits due to the introduction of the phantom loading coils is slight, and the loaded phantom has materially higher transmission efficiency than either of the side circuits.

By the adoption of this phantom loading, the preliminary work on which is just being completed, one of the chief drawbacks to the extensive use of aerial loading will be overcome, and at the same time the range of transmission will be considerably increased. The limitation to loading which has existed in the past due to inability to phantom the loaded circuits has been due to the fact that it has been necessary to choose between the economies of phantoming with practically no increase in the transmission range, or to load the physical circuits thus extending their transmission range and to provide additional physical circuits to care for increased traffic. With phantom loading both benefits will be available.

SUPERIMPOSED TELEGRAPH.

All of the long-distance toll lines are used for superimposed telegraph working. This applies also to phantom circuits.

Both simplex and composite combinations are in use. Both involve grounded telegraph operation. In the first of these the two wires of a pair are used in parallel as a telegraph conductor, and in the second each wire is used as a separate telegraph circuit. Straight and duplex Morse working are in vogue, and while automatic keys are used to a considerable extent, there is no present operation of high speed machine sending. The loading of circuits does not interfere in any way with their applicability for telegraph purposes except that it places a limitation on the maximum value of the telegraph current—*i. e.*, it is not possible to employ such currents as will magnetise the loading coil cores.

CABLE IN CONNECTION WITH THE LONG-DISTANCE TELEPHONE SERVICE.

Paper insulated cables are employed for two purposes in connection with the long distance telephone plant (this does not include the use of cables for toll-switching trunks). The first of these is for bringing open wire toll lines into the centers of cities where it is not possible to install and maintain open wire leads, and the second is for use between large toll centers where the volume of terminating traffic is such as to require a large number of circuits. Under these conditions it is economical to instal underground toll cables for very considerable distance.

For both classes of service the cables are invariably loaded.

TOLL ENTERING CABLES.

Cables for toll entering purposes range in size from No. 16 to No. 13 B. & S. gauge conductors, depending upon the character of the open wire toll lines and are the loaded, light, medium or heavy, depending upon their length, upon whether the open wires are non-loaded or loaded and upon whether the toll switching trunks are non-loaded or loaded. As the number of circuits in the toll entering cables is always in excess of the number of toll lines to be brought in, considerations of the warranted expenditures for a given transmission gain result in the cable conductors being somewhat smaller than those of the open wire lines which they are to serve. In determining the proper gauge of any toll entering cable, this cable is so arranged as to be in cost-equilibrium with the open wire plant which it is to serve.

DUPLEX CABLES.

At the present time practically all of the toll entering cables are of ordinary construction, that is, not arranged for phantom working. Duplex cables and proper loading coils for use on them have recently been devised and are being installed. The employment of such cables will make it possible to employ phantoming of the open wire plant to full efficiency, as it will remove the necessity of placing the phantom repeating coils on the outer end of the toll entering cable by permitting the phantom circuits to be carried into the toll office as such, thus making all the wires available for composite operation.

TOLL CABLES.

Between certain large cities—for example, between New York and Philadelphia, New York and New Haven, Chicago and Milwaukee, Boston and Worcester, Boston and Brockton—the volume of traffic is sufficient to warrant the provision of special high-grade loaded cable circuits in underground conduit. At the present time these circuits are in cables

of ordinary construction, that is, not arranged for phantom working, and are usually provided with heavy loading. To provide the necessary transmission efficiency the cable conductors for the long haul circuits are usually No. 14 or No. 13 B. & S. gauge. A certain number of smaller gauge conductors for service to intermediate points are frequently incorporated in the same cable sheath. The standard full-sized sheath is 2⅝ inches outside diameter and the sheath thickness is ⅛ inch. The paper insulated conductors have a mutual electrostatic capacity of about .068 mf. per mile.

In cases of this kind, where a large number of circuits are provided in a single sheath, special rapid operating methods are in vogue. The circuits are also employed for superimposed telegraph working.

EXTENSION OF UNDERGROUND WORKING.

At the present time we are preparing to install an all underground cable route from New York to Washington, a distance of 235 miles, and from New York to Boston, a distance of 235 miles. The cable in these routes is to be of special duplex construction, that is, arranged for phantom working and both the side circuits and the phantom circuits are to be loaded. The cable will be of standard size and will contain seven squads No. 10 B. & S. conductors, eighteen squads No. 13 B. & S. gauge conductors, six pairs of No. 13 B. & S. gauge conductors unphantomed, and eighteen pairs of No. 16 B. & S. gauge conductors unphantomed. The loaded No. 10 gauge physical and phantom circuits and the loaded No. 13 gauge phantom circuits will give a high grade of transmission from New York to Washington or Boston, and the No. 13 gauge loaded side and non-phantomed circuits will give transmission to intermediate points. No 16 gauge conductors will be used for short haul service along the route for telegraph operation.

It will be seen that over the circuits of this cable phantom working will be accomplished, superimposed telegraph working will also be used, so that over two pairs of wires three independent telephone conversations may take place simultaneously, and at the same time eight telegraph messages may be sent, all without interference.

PHANTOM LOADING COILS.

With the standard coils now in use it is not possible to secure efficient phantom working. The coils have, however, been re-designed to eliminate this difficulty, and in the future all coils are to be manufactured so that they may be employed on duplex cable. In the case of the New York to Washington and New York to Boston cables the associated side circuit and phantom loading coils will be mounted in the same pots, all of the cross-connecting being done at the factory. The plant force will, therefore, have simply to connect the stub cable into the main cable.

Recent Telephone Patents

By David S. Hulfish

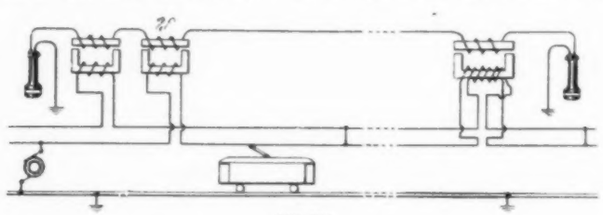
968,646. Annunciator. W. W. Dean, Elyria, Ohio, assignor to the Dean Electric Company, of same place. This is a signal of the "visual" class for switchboards, not a drop. The armature is constructed parallel to the core of the operating magnet, and slides when attracted.

968,938. Arrester. William S. Hale, Buckley, Ill. Upon the subscriber's telephone is mounted a round lightning arrester and the hook lever rotates the carbon disk each time the telephone is used, cleaning the arrester automatically.

969,095. Intercommunicating system. Alfred Ekstrom, Stockholm, Sweden.

969,403. Attachment. Cornelius R. Phillips, Philadelphia, Penn., assignor to J. Cook and J. B. Felheimer, of same place. A holder for the telephone receiver when in use. One portion of the attachment holds the telephone hook down when the receiver is not in use.

969,498 and 969,499. Telephone Circuit. C. F. Scott, Pittsburg, Penn., assignor to Westinghouse Electric and Manufacturing Company. In a grounded telephone line



969,498.

paralleling a grounded alternating current trolley line, transformers are cut into the trolley and the telephone line to neutralize the effects of induction between the two lines.

969,774. Intercommunicating System. H. D. Currier, Chicago, Ill., assignor to Western Electric Company, of same place. The novelty lies in means for including a condenser in series with the receiver, or in switching it out of circuit, as required.

969,789. Meter. Ray H. Manson, Elyria, Ohio, assignor to Dean Electric Company, of same place. A time registering mechanism, a clock movement for driving it, an escape and a rewinding device are placed at the subscriber's station; a magnet for permitting the clock movement to run is controlled from the telephone central office.

969,799. Intercommunicating and Private Branch System. J. L. McQuarrie, Chicago, Ill., assignor to Western Electric Company, of same place. Novel circuit arrangements permit the telephone user at the branch system to control the automatic signals at the common battery central office switchboard.

969,818. Drop. A. H. Weiss, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company, of same place. The armature engages the reed or finger for the shutter hook only by a spring pressure, that the armature may be swung upward to permit the removal of the spool from the case.

969,832. Receiver. Garrison Babcock, Rochester, N. Y., assignor to Simplex Telephone Equipment Company, of same place. The diaphragm is of two sheets, having a spring tendency to press together in the middle and both being thus under tension.

969,914. Pay Station. Joseph M. Spindler, Shakopee, Minn. A coin collecting device for telephone tolls is arranged to discriminate between good and bad coins.

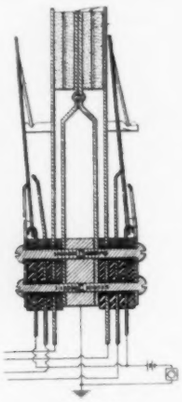
970,015. Attachment. Annie K. Cann, Watkins, Colo. An antiseptic cover for telephone mouthpiece.

970,066. Transmitter. O. M. Leich and N. Pedersen, Genoa, Ill., assignors to Cracraft-Leich Electric Company, of same place. The improvements are in mechanical details of assembly of the usual type of granular carbon transmitter.

970,078. Insulator. John A. Meurling, Chicago, Ill. The wire is caught and kinked among three supporting points, no tie wire being required.

970,169. Protector. Jules A. Birsfield, Rochester, N. Y., assignor to Charles A. Brown and Lynn A. Williams, Chi-

cago, Ill. In lieu of the heat coil of a central office protector, a thermal couple bending when heated is used, the whole being arranged to snap open when the temperature of the thermal element passes a set limit.



970,169.

970,288. Telephone Repeater. Charles Adams Randall, New York, N. Y. To avoid the singing of a repeater system, two normally closed circuits are used, each having means for rendering the other operative.

970,449. Attachment. A. C. Hewitt and W. C. Thomas, Philadelphia, assignor of part to G. W. Krout, of same place. A device for holding the receiver of a desk telephone while in use. A hinged arm is bent when the telephone is not in use, thereby holding the switch lever down.

970,821. Automatic Selector. Howard B. Holmes, Park Ridge, Ill., and E. B. Craft, Wilmette, Ill., assignors to Western Electric Company, Chicago, Ill. In combination with stationary line terminals and a brush carrier trailing brushes over them, magnets are provided for advancing the brushes in long steps or short steps.

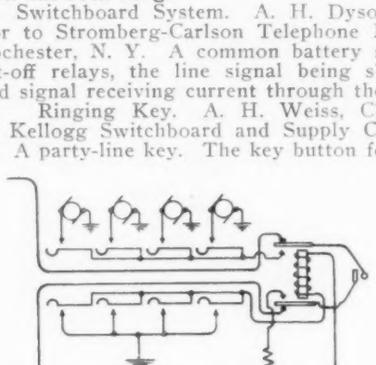
970,975. Private Branch Intercommunicating System. J. N. Wallace and E. B. Craft, assignors to Western Electrical Company, Chicago, Ill. A polarized relay is used in connection with circuits for controlling from the telephones the switchboard signals of the central office.

971,237. Attachment. Joshua W. Atlee, Riverton, N. J. In connection with the telephone, an amplifier is provided which supports the receiver and renders it loud speaking while in use.

971,352. Party Line Indicator. C. C. Bradbury, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. In the cord pair, a ringing key has a button and a supervisory lamp for each station, showing which station has been rung.

971,598. Switchboard System. A. H. Dyson, Chicago, Ill., assignor to Stromberg-Carlson Telephone Manufacturing Co., Rochester, N. Y. A common battery switchboard without cut-off relays, the line signal being shunted out, and the cord signal receiving current through the line relay.

971,650. Ringing Key. A. H. Weiss, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. A party-line key. The key button for each station on the line selects the proper generator of ringing current and operates a relay which then connects the bus wire of the key to the talking circuit of the plug.



971,650.

971,651. Trunk. C. S. Winston, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, of same place. A toll-to-local switchboard trunk for the Kellogg type of switchboard.

971,691. Handle. Charles A. Barnes, Sr., Greenfield, Ind. A handle for holding the telephone receiver when in use is so designed that it will hang conveniently upon the telephone hook when not in use.

972,114. Antiseptic Attachment. A. P. Levi, H. Schlessinger and M. Schlessinger, San Francisco, Cal. The funnel of the transmitter is perforated, and a clamping ring holds an absorbent and disinfectant outside the mouthpiece against the perforations.

972,329. Lockout Device. William M. Bruce, Jr., Springfield, Ohio, assignor to American Automatic Telephone Company, Rochester, New York. At a common battery telephone a bridged relay is adjusted to respond when no other station is upon the line and not to respond when another station upon the line has reduced the difference of potential between the two line wires.

972,399. Signal. John W. Nilsson, Balfour, N. D. In a telephone which rings its number audibly upon the line when the receiver is lifted, an interference is provided that the hook lever may not be depressed until the complete signal has been rung upon the line.

972,424. Relay. Lynn A. Williams, Chicago, Ill. A compensator for the magnetic law of squares. As the armature is attracted, the mechanical advantage upon the springs is decreased.

972,628. Switchboard System. A. D. T. Libby, Elyria, Ohio, assignor to Dean Electric Company, of same place. In a three-way cord for common battery switchboard, the supervisory lamp circuit is closed by a relay in the third strand.

972,634. Relay. Charles H. North, Cleveland, Ohio, assignor to North Electric Company, Cleveland, Ohio. In a relay of the return-pole-piece type, to secure a small air gap and a large movement of the operating end of the armature, the switch springs are mounted upon the armature end of the return-pole-piece and the armature bell crank lever extends for the length of the pole piece to reach the operating end of the switch springs.

972,715. Receiver. G. W. Pickard, Amesbury, Mass. Spark gaps are provided within the receiver, so that lightning discharges may not pass through the receiver windings.

972,814. Relay. J. F. Cadell, Baltimore, Md., assignor to North Electric Company, Cleveland, Ohio. The bell crank armature of a return-pole relay is hung below the return pole, that its bell crank end tends to close the magnetic circuit to the return pole at the same time that its armature tends to close the magnetic circuit to the core.

972,839. Attachment. W. C. Fisk and H. L. White, Orofino, Idaho. A spring-driven attachment is released when the receiver is lifted, to ring audibly upon the telephone line the number of the station. This announces to stations in conversation the number of another station upon a party line which has lifted the receiver.

The New York-Denver Toll Line

The American Telephone and Telegraph Company recently completed its new copper toll line between Denver and New York City, at which time a conversation was carried on between W. D. Emerson, connected with the Colorado Telephone Company of Denver, and the wire chief of the American Telephone and Telegraph Company at New York City, a distance of 2,500 miles and a record breaker in long distance conversation. The company now has a through No. 8 copper circuit from Denver to New York City. This has been the result of years of experimentation and research and is due to the fact that by the introduction of certain appliances discovered in these researches the efficiency of the toll lines as regards long distance transmission of the voice vibrations is nearly tripled.

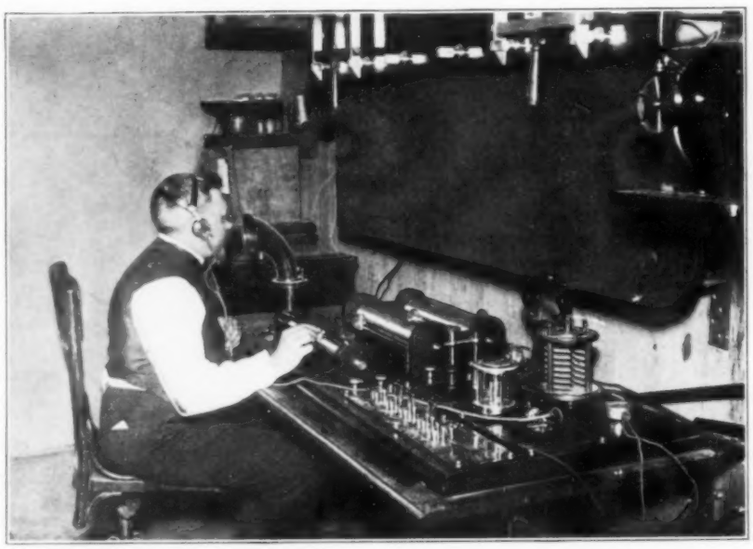
Aside from the fact that it breaks all records for long distance conversations, this test is interesting in that it means an evolution in the handling of toll lines the world over.

DEPARTMENT of RAILWAY TELEPHONES

Wireless Operation of Railways

By A. F. Miller

WHEN wireless transmission shall have become an every day affair and poles and wires have been banished from our midst, among those to whom gratitude and honor shall be due for having been instrumental in bringing about this modern miracle is Dr. Frederick H. Millener of the Union Pacific, Omaha, who is attracting world-wide attention for his experiments along these lines. Dr. Millener believes that wires of all kinds are useless and but serve to disfigure our streets, and that they will eventually be relegated to the junk heap, even our electricity for lighting purposes being transmitted to us by wireless.



Dr. F. H. Millener Tuning Wireless Instruments in His Workshop.

While it is stated that the Millener apparatus works on the same principle as the Marconi and De Forest systems, being a combination of the best points of these two systems and his own ideas, still very little is actually known regarding his experiments. Great secrecy has been maintained not only by Dr. Millener, but by the Union Pacific as well, due, it is stated, not only to the great and patentable value of the devices, but also to their close connection with other devices in contemplation.

All the apparatus is assembled by Dr. Millener personally, leaving to assistants only the minor details. The work is shifted from time to time so that no two parts are made at the same time or place or by the same workman, in order to guard the secret more closely.

A wireless system for communicating between stations has been perfected as well as for communicating between stations and moving trains. The Union Pacific is establishing a main plant at its headquarters in Omaha and branches at Sidney, Nebraska, and Cheyenne, Wyo. As these stations are about two hundred miles distant from each other, it would be impossible to regulate the traffic of an extensive railroad system thereby, but the stations can be utilized as a foundation for a system which will establish communication between the dispatcher and the engineer direct.

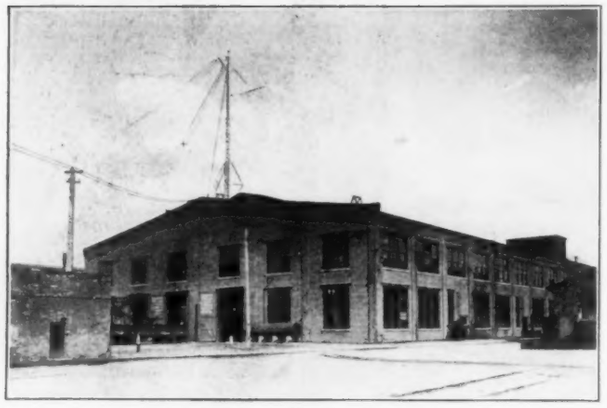
The Pennsylvania railroad has also established an experimental station at Altoona, Pa., consisting of a mast located on a mountain 1,655 feet above sea level, the receiving apparatus being 1,735 feet above sea level. This apparatus has been able to communicate with other wireless stations along the eastern coast and with vessels at sea.

Along with the development of a wireless telegraph system Dr. Millener has also been ex-

Department of Railway Telephones

This department is established as a permanent feature of TELEPHONE ENGINEER. The progress of the art of telephone train dispatching, its technical developments, its news, and the elucidation of its mysteries for the non-technical worker will be found each month in these pages. The editors invite the problems and solicit the co-operation of the many readers of TELEPHONE ENGINEER in all parts of the world whose interests lie along these lines.

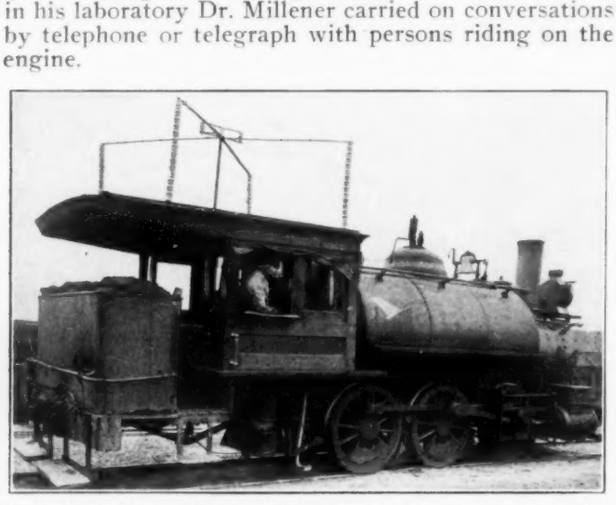
Wireless Operation of Railways. By A. F. Miller 165-167
Railway Telephone Calls in Wisconsin 167
Confirms Telephone Award 167
A Study of Telegraphic Transmission. By Frank F. Fowle 168-169
Protection of Telephone Circuits. By W. E. Harkness 170-171
Vail on Long Distance Calls 171
Train Dispatching Standards of C. & W. I. 172
Telephones on Arkansas Valley Interurban 172
Another Gill Selector Bulletin 172



Shops of the Union Pacific at Omaha, Showing Wireless Antenna.

perimenting with a wireless telephone system to be operated in connection therewith, and which will establish communication with moving trains. As a double safeguard he has invented an electric cab signal, also operated by wireless, in connection with the block system already in use, which shows the movements of the signals at each end of the block upon which the train is running. The latter has not been developed as yet, being discovered incidentally in connection with his other wireless experiments, but when in actual use it will act as follows: Orders will be issued from headquarters by the chief dispatcher, through the medium of wireless telegraphy, to the division dispatcher, who makes up his charts and by means of the wireless telephone communicates with the engineer and conductor of the train. By this means the chief dispatcher has every train under his immediate supervision, thus centralizing the responsibility and eliminating the liability to wrecks due to confusion of orders. Conversations have been carried on with stations in the West Indies, with the station at Havana, and with ships in the harbor of that city.

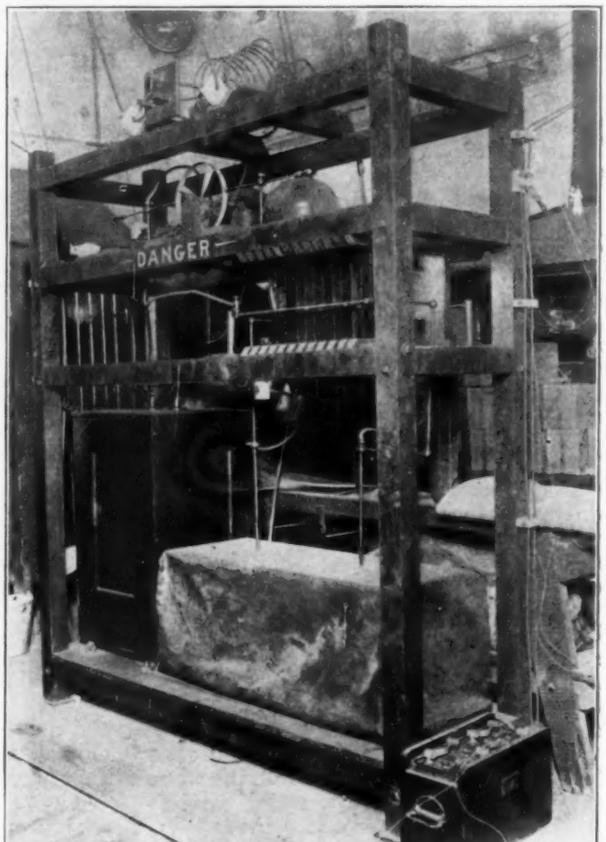
The apparatus used in these experiments consisted at first of an old switch engine, equipped with antennæ suspended from insulated posts on the roof of the cab; but later the antennæ were discarded, the metal roof of the cab was insulated and wires extended to the different devices under experimentation, the ground being made through the wheels. While seated in his laboratory Dr. Millener carried on conversations by telephone or telegraph with persons riding on the engine.



Engine Fitted for Receiving Wireless—Receiving Instruments in the Cab.

Dr. Millener's latest invention, and one in which he takes considerable pride, is a wireless truck, built during odd moments while experimenting with his other devices and as a sort of recreation, we might say. The power for operating this truck is transmitted to it by wireless. Although not yet in practical use very extensively it has been experimented with quite successfully.

The photographs shown here are published through the courtesy of Mr. James R. Quirk, editor of *Popular Mechanics*. They show Dr. Millener tuning wireless telephone instruments in his laboratory at Omaha, and standing beside his "wireless truck." The Union Pacific shops with their wireless aerials, the locomotive with its receiving devices, and the first wireless set made and used for experimental purposes at the Union



First Wireless Set Made and Used at the U. P. Shops.

Pacific shops are also shown in the illustrations here.

Dr. Millener surprised 500 members of the New York Railroad Club when lecturing before them recently by announcing casually that he and his associates have perfected the system.

A picture was flashed on the screen, showing a young man walking in the rain holding an umbrella over his head and with an ordinary telephone receiver to his ears.

"This young man uses the umbrella to catch the tone waves from our end of the wireless telephone," said Dr. Millener. "Although hundreds of feet away, he hears the telephone distinctly.

"We have no desire to exploit it, but I will say, however, that we have talked with moving trains at a

A Wirelessly Operated Truck.

distance of five miles with our apparatus, and we believe we can talk with a moving train wirelessly at a distance of thirty-five miles."

At the conclusion of the meeting many of those present, who represented practically every important railroad in the country, pressed about Dr. Millener and eagerly demanded details of the invention. Among these were Frank Hedley, general manager of the Interborough; W. J. Harriman, vice-president of the Erie; Herbert H. Vreeland; C. W. Huntington, general superintendent of the Jersey Central; R. H. Merriott of the United Wireless Company; Charles Hine, close friend and associate of the late E. H. Harriman, and many others.

Railway Telephone Calls in Wisconsin

It is related in the forthcoming annual report of the Wisconsin Railroad Commission how the inspectors for the commission investigated alleged delays and discourtesies in answering telephones in railway stations.

Wherever practicable the inspectors call up railroad stations to ascertain the promptness and decorum of the railroad station agent and employes in giving information when requested by telephone. Two or three instances were observed where the station agent paid very little attention to answering telephone inquiries. These facts were embodied in the routine reports of the staff to the commission and in turn reported to the higher railroad officials, with the result that proper attention was thereafter given to telephone calls by the railroad employes so reported. In some instances these special tests have been made after informal notification by local citizens. In one such case the railroad employes claimed that they habitually took all reasonable care in answering the telephone calls, but that they were annoyed by the telephone operator ringing up at times when trains were at the station or the agent was otherwise occupied in work which would not allow him to answer the telephone. This case aroused considerable local irritation, and arrangements were made to have the matter secretly investigated by two inspectors of the commission. One inspector remained at the railroad waiting room while the other called up the station at various intervals from different parts of the city. Each inspector was supplied with a stop watch, and the time to get central, the time to get the party, and the information given by the agent were recorded by the inspector making the calls. The time elapsing after the telephone rang before the agent answered, his occupation at the time the telephone rang, and other pertinent matters were noted by the inspector at the station. The calls made during the first half day indicated that the telephone operator did not always ring the depot on call, and that excessive time was required by her in answering and making connections. It was also observed that the agent failed to answer the telephone many times when he was not busy with his other work, and when there was no good reason for his neglecting to answer. During the second half day the telephone operator seemed to become aware that an inspection was in progress, as indicated by a sudden improvement of service. The agent at the station, on the contrary, became angry and instructed "central" to make no more connection for the man who was persistently calling him up, and the inspector in the waiting room observed that the agent thereafter refused to answer practically all calls which came in . A detailed report of this inspection was sent to both the telephone company and to the railway officials, with the natural result of improving the service rendered to the public by both parties.

It is the plan to continue this inspection work along these same lines, following up by letter and by further inspection the places where the telephone service is below standard to such extent as may be necessary to bring about the desired results. It is not considered necessary at this time to specify allowable limits of speed of operators in answering calls, but with the data already collected it is a comparatively simple matter to show when any exchange is furnishing service abnormally bad or exceptionally good by comparison with the average curves for other exchanges of similar size and type, or with the curves of the same exchange during periods when giving normal service. It is believed that this policy has already improved the service quite materially in a large number of exchanges in the state, due to the fact that operators never know when an inspector of the commission is making a number of test calls, and also to the fact that telephone managers and other officials have thought more about the quality of service furnished since these tests were undertaken than was the case prior to that time. It is believed that high economy has been employed in this work, since much of the data have been collected in connection with other inspections at practically no additional expense.

Confirms Telephone Award

Judge Colt, in the United States Circuit Court, has confirmed the report of Everett W. Burdett as master in the suit of the Western Union Telegraph Company against the American Bell Telephone Company for an accounting on stocks received by the Bell Company as rentals and royalties for telephone licenses.

Under a contract dated November 10, 1879, the Western Union claims 20 per cent of this stock, together with the dividends and interest thereon, amounting to $5,873,292 and 38,188 shares of stock. The Bell Company contended that the Western Union was not entitled to any of this stock, as it was not received as a rental or royalty.

The Master awarded the Western Union 20,087 shares of stock and $2,579,914 as dividends and interest thereon, exempting from the accounting stock received by the American Bell from the American Telephone and Telegraph Company, the New England Telephone and Telegraph Company, the Bell Telephone Company of Philadelphia, and the Chicago Telephone Company.

A Study of Telegraphic Transmission

By Frank F. Fowle*

V. TENSILE STRENGTH REQUIREMENTS.

SLEET AND WIND LOADS.

SUSPENDED wires must have the strength to sustain, besides their own weight, the stresses caused by accumulations of sleet and by wind pressures. The conditions of maximum severity occur with sleet and wind in combination, but what combination to take in any locality is still an unsettled question. In order to throw more light on this matter a study was made of the records of the United States Weather Bureau at Chicago, Ill.

The Weather Bureau records of wind velocity are taken by means of the well-known cup type of anemometer. The hourly and daily maxima are obtained from the differences of readings at five-minute intervals. A study of the daily maxima for the five years from 1905 to 1909, inclusive, or 1,826 days, gave the following results:

Maximum Daily Velocity M. P. H.	Number of Days a Given Maximum was Observed.
0 to 10	14
11 to 20	501
21 to 30	774
31 to 40	404
41 to 50	114
51 to 60	18
61 to 70	1
	1,826

The most prominent velocity is one of about 25 miles per hour. A similar study of the monthly maxima for 20 years, from February, 1890, to January, 1910, inclusive, is next given:

Maximum Monthly Velocity M. P. H.	Number of Months a Given Maximum was Observed.
31 to 40	22
41 to 50	106
51 to 60	85
61 to 70	18
71 to 80	8
81 to 85	1
	240

The extreme probable maximum, for five-minute intervals, is not over 85 miles per hour. The usual character of high winds is puffy or fluctuating, and the average maxima for five-minute intervals are not the extreme or true instantaneous maxima. Observations taken at Washington, D. C., with the Dines pressure anemometer show that the instantaneous maxima exceed the five-minute averages of the Weather Bureau, uncorrected, by about one-third.

In order to find the probable wind velocities during sleet storms, the records were searched for ten years, from 1900 to 1909, inclusive, to note the daily maxima during the occurrence of sleet.

Maximum Velocity M. P. H.	Number of Days a Given Maximum was Observed.
11 to 15	1
16 to 20	1
21 to 25	4
26 to 30	10
31 to 35	3
36 to 40	5
41 to 45	7
46 to 50	5
51 to 55	3
56 to 60	1
	40

Velocities of 50 miles per hour were noted during several bad storms. All of the velocities given were recorded at about 300 feet above the street level. The velocity which may be expected at a point about 20 feet above the ground in any given locality will depend greatly upon the contour of the surrounding country, the location of protective objects such as trees and buildings and the direction of the wind. In open, exposed country the maximum will probably approach closely the Weather Bureau values. In different sections of the country the characteristic winds are sometimes quite unlike.

Taking the Weather Bureau maximum at Chicago during heavy sleet storms, of 50 miles per hour, the true instantaneous maximum would be about 65 to 70 miles. But only in exposed places would this velocity be realized, and in many instances it would be conservative to anticipate velocities not exceeding 40 to 45 miles per hour.

The formation of sleet is caused by sub-cooled rain drops descending into a lower atmosphere of 32° F. temperature. They do not freeze in falling because of the constant agitation which results from their rapid passage through the atmosphere, or from movements of the atmosphere itself. When these drops find a lodging place and become quiet they freeze. Sleet formations in many cases are unsymmetrical, but on wires they are usually cylindrical, although icicles sometimes form on the lower side.

The greatest amount of sleet precipitation noted in the Weather Bureau records above mentioned, for the ten-year period, was nearly 2.5 inches; 0.5 inch was frequently noted and in one case 0.8 inch. Assuming that the formation will be of uniform radial thickness around the wire, this indicates that the total diameter of wire and sleet will frequently be one inch greater than the wire diameter, occasionally 1.5 inch and in a few instances more than that. In one severe storm in Chicago I noted a diameter of about 2 inches, which remained on the wires several days.

The wind pressure on cylindrical wires is given by the formula,

$$p = .002\ V^2 \qquad (97)$$

where p = pressure in pounds per square foot of projected area,

V = wind velocity in miles per hour.

*A report on the use of copper, iron, and copper-clad steel wires in telegraph service, made to Frank R. Chambers, Jr., vice-president of the Duplex Metals Company, August 1, 1910. Continued from the February number of TELEPHONE ENGINEER.

This can be expressed also in the form,

$$p = \left(\frac{d + 2t}{6{,}000}\right) V^2 \qquad (98)$$

where d = wire diameter in inches,
t = radial thickness of sleet in inches,
p = pressure in pounds per lineal foot of wire, when the wind direction is perpendicular to the wire.

Assuming that the weight of sleet is 57.5 pounds per cubic foot, the total weight per lineal foot of wire is,

$$w = 1.25t\,(d + t) + w_1 \qquad (99)$$

where w = weight of the wire in pounds per foot.
W = total weight in pounds per lineal foot, and d and t are as given above.

Taking the wind direction as normal to the wire and horizontal, the resultant force due to the gravity sleet load and the wind pressure, per lineal foot of wire, will be

$$W = \sqrt{w^2 + p^2} \qquad (100)$$

In the case of considerable sleet load, the wire weight is not of much importance. But assuming a No. 9 B. & S. gauge wire of copper, the diameter is .114 inch and the weight per foot is .040 pound. The total load per foot, for various sleet and wind loads, will be as follows:

Radial Sleet Thickness in Inches.	—Wind Velocities, M. P. H.— 40.	50.	60.	70.
.25	.225	.299	.399	.524
.50	.518	.629	.792	1.00
.75	.957	1.09	1.29	1.57
1.00	1.54	1.68	1.92	2.25

The common method of computing the tension in wire spans is to assume that the wire hangs in a curve which is represented by a parabola, when the ratio of sag to span length is very small. While the curve in fact is a catenary, this assumption is very approximate.

When the supports at the ends are at equal height, the tension at the center of the span in pounds is,

$$H = \frac{W\,L^2}{8\,D} \qquad (101)$$

where L = span length, in feet,
D = sag at center of span, in feet,
W = value given in (100).

The maximum tension occurs at either support and is,

$$T = \frac{H}{L}\sqrt{L^2 + 16\,D^2} \qquad (102)$$

but where $\frac{D}{L}$ is very small, the value of T is approximately the same as H.

Much telephone and telegraph wire is erected under specifications calling for about six inches of sag in a 130-foot span, at a temperature of 30° F. The horizontal tension due to the weight of wire alone is, from (101), about 167 pounds. Assuming wire to be erected under these conditions, and assuming further that it was absolutely inelastic or rigid under stress, the horizontal tension with 0.50 inch of sleet thickness and 40 miles of wind would be about 2,190 pounds, or such as to break any wire of this size.

But no wire materials are rigid under stress; instead they shorten under compression and elongate under tension. The elongation of any given wire is proportional to the load upon it, up to a certain point, beyond which it stretches, until it breaks. This point is termed the elastic limit. Any stress exceeding the elastic limit, but not exceeding the breaking weight, will permanently stretch the wire. The property of elongation under stress, without stretching, is very important in its relation to wire spans. When the ratio of sag to span length is very small, a small increase in the length of the wire produces a large increase in the sag. Increasing sag, for a given span and load, diminishes the tension, as seen from (101). That is, when the load increases, due to wind and sleet, the wire elongates, and this in turn prevents the tension from increasing as fast as the load.

This shows that an ideal wire must have two mechanical properties, namely, high tensile strength and a high ratio of elastic limit to tensile strength. These properties will insure a minimum of stretching. It is frequently necessary after sleet storms, with copper wires especially, to take up the slack so that the wind will not swing the wires together, which adds to the cost of maintenance.

In order to illustrate the relation between sag and wire length, the following table has been prepared, using the formula for wire length in the span as given below, with 130-foot span: (103)

$$L_0 = \frac{1}{2}\sqrt{L^2 + 16\,D^2} + \frac{2.3026\,L^2}{8\,D}\log\left(\frac{4\,D + \sqrt{L^2 + 16D^2}}{L}\right)$$

D Sag in Feet.	$\frac{D}{L}$ Ratio of Sag to Span.	L Length of Wire in Feet.	$\frac{L^2}{8D}$ Tension for a Load of One Pound Per Foot.
0.5	.003846	130.01	4,225
1.0	.007692	130.02	2,113
2.0	.01538	130.07	1,056
3.0	.02308	130.19	704.2
4.0	.03077	130.33	528.1
5.0	.03846	130.51	422.5
6.0	.04615	130.74	352.1
8.0	.06154	131.30	264.1

The values of wire length, L_0, given in this table, show how little elongation is necessary to relieve the excessive stresses which otherwise would exist. The amount of permissible elongation is fixed by the elastic limit and the modulus of elasticity. If M is the modulus of elasticity in inch-pounds and F is the elastic limit of stress in pounds per square inch, the permissible elongation without stretching is,

$$e = \frac{F}{M} \qquad (104)$$

The action of a given wire material depends upon its tensile strength, elastic limit and modulus of elasticity, and upon the conditions under which it is erected with regard to span, sag and temperature. These conditions vary so much there is not room here for an extended discussion, but the subject will be treated further in discussing the properties of different wire materials. But comparisons of different materials should always include tensile strength, elastic limit and modulus of elasticty.

Protection of Telephone Circuits

By W. E. Harkness

THE protection of electrical apparatus connected to aerial telephone, telegraph and signal wires has been one of the principal subjects of investigation by those interested in the design, installation and maintenance of electrical equipment. The most important factors entering into this problem are common to every system of distribution, whether telephone, telegraph or signal.

The source of trouble may be divided into two distinct classes.

1—Electrical disturbances in the atmosphere.

2—Foreign circuits of high potential.

The first of these may be subdivided into:

(a)—Direct lightning strokes.

(d)—Induction from adjacent circuits.

This second subclassification may also be further divided into:

(c)—Leakage from or contact with other circuits.

(d)—Induction from adjacent circuits.

Most aerial circuits are subject to trouble from both of the primary sources mentioned, although there are some which are subject to only the first named of the two mentioned, i. e., atmospheric disturbances.

To protect properly circuits and apparatus, a protector must be provided which will:

First.—Reduce the potential on the circuits to a point where it cannot injure the apparatus or interfere with its operation.

Second.—Prevent an excess flow of current through the line which would destroy the apparatus or wire.

Third.—Reduce the chance of injury to the users of the apparatus.

The usual method of guarding against high potentials is to provide some sort of a protector offering, for currents of high potential, a path to earth which has a lower break-down point than is offered by the insulation of the circuit or apparatus. In general, such protectors consist of two conducting bodies, one connected to the circuit and the other to earth, the opposing or discharge faces of the blocks being separated by a poor, or non-conductor. This arrangement produces a narrow air space between the blocks which serve as the path to earth for the high potential currents. In the majority of cases these protectors are exposed to the atmosphere; in some cases, however, they have been placed in tubes from which the air has been exhausted to create a partial vacuum.

The sensitiveness of these protectors, aside from questions of mechanical construction, is governed by the separation of the discharge surfaces, the nature of the insulating separators and whether they are exposed to the atmosphere or are in a partial vacuum. The rules governing these three factors are well-known and need not be discussed here.

The materials used in the construction of what may be called the "open space" type protectors have been varied, carbon and both similar and dissimilar metals being used for the discharge surfaces and mica, paper, silk, linen and celluloid being among the insulating separators employed.

Carbon blocks, separated by mica separators, have been generally used in the protection of telephone apparatus. Carbon such as is used in vacuum tube arresters has the advantage of being able to withstand repeated discharges without being destroyed or having the reliability or efficiency of the protector affected. The trouble experienced with carbon generally used for this purpose is due to poor quality, which permits particles to break off and collect between the two discharge surfaces, which in the usual telephone protectors are within .005 inch of each other, and thus cause a leak to earth. Attempts have been made to overcome this trouble by increasing the separation of the carbon blocks and by shaping the opposing faces, but none of these has been successful as the increased separation decreases the sensitiveness of the protector, permitting the rise of an objectionable potential on the line before the protector acts. The separation of .005 inch is necessary, in the type of protector mentioned, to obtain protection against crosses with circuits carrying potentials of 500 volts. High grade carbon does not disintegrate and is used in the vacuum type previously mentioned, thus overcoming the trouble experienced with lower grades.

Metal in place of carbon has been used with varying success, depending upon the protection desired. It has not been as satisfactory as carbon, owing to the fact that the metal blocks tend to fuse together by discharges, or that the distance between the discharge surfaces is altered by the spitting or vaporizing of the metals, thus changing the breakdown point of the protector, with the result of reducing its efficiency and reliability. Metal blocks are also subject to corrosion. The so-called non-arcing metals have been tried, but have not proven superior to others.

Various dielectrics, such as mica, hard rubber, silk, linen and celluloid have been used to obtain the proper spacing of the discharge surfaces. Of these mica seems to be the best, as it is practically fireproof, non-hygroscopic and can be split to give separators of accurate thickness.

In any type of open space protector it is essential that the base and supports to be so designed as to establish good contact with the protector blocks and retain them in their proper relative position to insure the normal and uniform operation of the protectors. An objection common to the majority of protectors is that the mountings are not designed to secure the highest insulation between the line and ground when the protectors are exposed to dust, smoke and moisture.

A further objection to many of the various types of protectors now on the market is the fact that the separation of the discharge surfaces is not accurately gauged, nor does it remain constant after repeated discharges. As a result the break-down point is usually far in excess of that of the apparatus which it is supposed to protect.

PROTECTION AGAINST ABNORMAL CURRENTS.

So far, protection against high potential only has been considered. There still remains the need of protection against abnormal currents or those of excessive strength. There seems to be but one recognized method of providing this protection, *i. e.*, by means of properly proportioned fuses which will operate when currents

above a predetermined strength flow over the circuit. There are two general types of fuses used; the open or link fuse and the enclosed or tubular type fuse.

There seems to be no question as to the superiority of the enclosed or tubular type fuse over the open link fuse. The enclosed type not only affords a mechanical protection to the fuse wire, but insures better contact and more accurate and reliable operation.

In many cases the function of the fuse has been confounded with that of the open space protector and the service has been interrupted and maintenance expense increased without securing proper protection by the use of fuses of too small a carrying capacity. In other words, the fuse was supposed to act as a protection against lightning or high potential discharges instead of against abnormal currents. In fact, in some cases, the mistake has been made of using it to the exclusion of the lightning arrester.

When determining the capacity of a fuse to be used in the protection of a specific piece of apparatus the following points should be considered:

1—The amount of current which the fuse must carry continuously under normal conditions.

2—The amount of current which the wiring or apparatus can carry for a given time without undue heating or injury.

3—The possible source of trouble from other circuits of high potential.

Having determined these points, a fuse of suitable carrying capacity can be used which will afford the desired protection without causing excessive maintenance or frequent interruptions to the service.

In view of the fact that most aerial circuits are exposed to both lightning strokes and crosses with foreign circuits carrying large currents or high voltages, it is customary and, in fact is necessary, to provide both the lightning arrester and the fuse.

In the protection of telephone lines and apparatus it has been customary, where the lines are entirely removed from possible contact with foreign circuits, to use the lightning arrester only. Owing, however, to a rapid extension of the electric light, electric railways and the building of high-tension transmission lines it is now considered advisable to install both the lightning arrester and the fuse, in order to provide adequate protection for any conditions which may arise in the future.

The standard method of protecting apparatus is to bring the line wires through the fuses to the lightning arrester and from there to the apparatus to be protected. With this arrangement, using properly proportioned fuses and lightning arresters, high potentials are removed from the line by the open space protector without blowing the fuses, unless the current flowing over the circuit is in excess of the predetermined safe amount, in which case the fuses blow and disconnect the apparatus from the line carrying the dangerous current, thus preventing damage.

THE LOCATION OF PROTECTORS.

The proper location of protectors in the circuit has been regarded as open to discussion. Opinions differ as to whether they should be placed on the poles or cross arms adjacent to the line wire, in the offices, or in the relay or signal cases. It is believed by many that the lightning arresters should be located as close as possible to the line wire, because from this position the ground wires can be run to earth by the shortest route and with the minimum number of bends, and also because it places the protector nearer the source of trouble. Objection may be raised to this location only where long spans of wire are used to connect line wires to the apparatus. Under such conditions it is possible, although improbable, that these wires may become crossed with other circuits, or struck by lightning.

LIGHTNING ARRESTER GROUNDS.

The methods employed in obtaining a satisfactory ground vary in different parts of the country, and numerous devices have been put on the market for this purpose. The use of a galvanized iron ground rod is common among the telephone companies. Such rods should be driven to reach earth permanently damp. Another practice is to bury a coil of wire or a copper plate at such depth as to make contact with damp earth. It has been thought that the use of charcoal or coke around the ground plate would be advantageous on account of their quality of retaining moisture. Some railways have used cinders from the front end of locomotives for this purpose. It is believed, however, that the use of cinders is not as satisfactory as charcoal, because cinders, and coke as well, contain certain acids which may affect injuriously the ground plate or the connecting wire. Another important consideration is that the connection between the wire and the plate should preferably be brazed or riveted, as the use of dissimilar metals may cause electrolytic action at the point of contact, which may eventually cause a disconnection between the ground wire and the plate.

The wire used in making connections between protectors and the earth should be of size sufficient to stand any mechanical strain that may be placed upon it, and should be run as directly to the earth as is possible, with the minimum number of bends. Where the direction of the wire must be changed, it is preferable to gain that result by a long curve rather than by a sharp bend, as lightning discharges are often deflected by sharp turns from the ground wire to adjacent objects. Where the ground wire is run through iron pipe, the pipe must be electrically connected to the ground wire at the point of entrance.

Vail on Long Distance Calls

Theodore N. Vail, president of the American Telephone & Telegraph Company, recently said: "What we are constantly studying is the curtailment of expense. Take, for example, the cost of a long distance call. You hear a good deal of complaint about high charges for long distance calls. But as conditions have existed in the past, we had to charge high

"Let the complainer do a little calculating and he will understand. There are about 240 pounds of copper in a mile of wire. At fifteen cents a pound, this means $72 per mile. Add to this the cost of poles, installation and all that, and we have $122 a mile. When a man in New York calls up Chicago, he has at his disposal about $125,000 of our property. Allowing six per cent interest on that sum, and another six per cent for depreciation, we have an annual cost of about $15,000, or $50 a day. That is a fixed charge, and the tolls must be high enough to leave an appreciable profit.

"Through contracts which have been made by the American Telephone & Telegraph Company and the Western Union, it is now possible for us to use these long-distance telephone wires for telegraph service. One wire will provide four telegraph circuits. In this way it will be possible to increase greatly the earning

capacity of the wires and open the way for a reduction in the tolls on long distance calls.

"Sending messages by both telephone and telegraph, which has been made possible by uniting the service of the American Telephone & Telegraph Company and the Western Union, affords far greater possibilities than are generally appreciated

"For example, you have a telephone in your home, and desire to send a message to some one in Springfield, Illinois. You telephone the message to an operator in a New York station, who telegraphs it to the Springfield station, where an operator calls up your friend and delivers the message over the telephone. By this service the company is spared the expense of collecting and delivering messages by boy, and it saves time to the public.

"Nevertheless, this difficulty is encountered. There is always a chance of error in receiving and transmitting the message by voice. For this reason we are now trying to find a way by which the spoken message may be recorded automatically at either end. We are experimenting with the phonograph, the telautograph and many similar devices. I believe some such means of record is possible, and before long will be in general use.

"I am often asked how far the telephone will be perfected for long distance calls. Only a few days ago we began operating a direct line between New York and Denver. I had a talk over the wire, and found I could hear and be heard satisfactorily. I think before long it will be possible to speak from here to San Francisco; but I do not believe that such long distance service by telephone alone will prove commercially practicable.

"Telephone vibrations cannot be relayed or strengthened like those of the telegraph. Telephonic waves have a tendency to flatten out the farther they go. If you pump into a short pipe the water comes out in spurts. Lengthen the pipe and the water has much less ebb and flow. This illustrates the working of the telephone.

"Wireless telegraphy so far has been chiefly used for selling stock. The wireless telegraphy will never take the place of the wire

"If two men are in a room they can carry on a conversation easily enough in low-pitched voices, even though standing in opposite corners. Put fifty men in a room and let them all talk at once, and the louder they shout the worse the confusion

"Drop one pebble in a pool in the water and the rebounding waves break each other into a maze of motion. So it is with wireless telegraphy. The more wireless stations send off messages, the more mixed up those messages will be.

"If we ever decide to enter the field of wireless telegraphy, it will be on our own account. The air is open to all"

Train Dispatching Standards of C. & W. I.

Following the lead of many of the largest railroads in the United States, which have decided that the telephone has greater advantages in the way of safety, speed and economy than the telegraph for the important work of train dispatching, the Chicago and Western Indiana has just ordered a complete equipment of railway telephone material. The new dispatching system will cover the entire line of this road and of the Belt Railway of Chicago, a subsidiary road.

There will be three circuits. One is the train dispatching wire of the C. & W. I. lines, another the train dispatching wire of the Belt Railway and the third a message circuit paralleling the train wire circuit at both roads. A total of 55 way station telephone outfits and 104 station selector outfits will be provided. The selector is a device by which the dispatcher will be enabled to call singly the several way stations along the line of the road.

At Eighty-third street, Chicago, the circuit will be terminated in a special switchboard. Special facilities will be arranged for handling the message wire, so that the circuit can be controlled from both the Dearborn street station and the Eighty-third street station.

Wires are now being strung by the railroad company. The best grade of copper wire is being used. The selectors to be furnished with this equipment are the new Western Electric local battery type, which are being used extensively by a number of the large trunk lines. It is expected that the entire system will be ready for service in a couple of months.

Telephones on Arkansas Valley Interurban

The Arkansas Valley Interurban Railway Company has just installed a complete telephone system for the dispatching of its cars. The system will enable the officers of the interurban to keep closely in touch with every car on its trips between Wichita and Sedgwick.

A private line from Wichita to Sedgwick was finished recently. A private switchboard in the office of President O. A. Boyle will enable him to reach practically any point on the line. Telephones have been placed in Sedgwick, Valley Center, at Twenty-first street and at every switch. There are ten telephones in all.

"This private telephone system will enable us to keep in close touch with everything that goes on anywhere along the line," said President Boyle.

Another Gill Selector Bulletin

Gill Selectors in telephone train dispatching are described in Bulletin No. 501 just issued by the United States Electric Company. Telephone dispatching has been so rapidly adopted in the railways of the United States that it may not be surprising to learn that although the first installation was put in service less than four years ago, more than 35,000 miles of line are now worked by this system. The bulletin describes the development of the selective calling system particularly in its application to railway telephony and explains fully the functions and services of the Gill selector and the answer-back. The selector is bridged directly across the telephone circuit and operated economically without the use of relays or local battery at the stations and without causing a loss in telephone transmission. The circuits and the outfits for calling with the local battery bell and the main line are described and illustrated and some facts regarding the economic advantages of substituting selective telephone train dispatching for the telegraph sounder call are convincingly assembled. The telephone train dispatching outfits of the United States Electric Company are so wired that they may be used without change for intercommunicating service, thus allowing, where such an arrangement seems desirable, any station to call any other on the line without ringing through the dispatcher's office. The selector outfits to operate under the various optional arrangements are conveniently grouped, as to equipment and designated by code numbers.

Of Interest to the Trade

Exhibits at the Convention

The fourteenth annual convention of the National Independent Telephone Association was well supplied with manufacturers' and dealers' exhibits. The following had space on the seventeenth and eighteenth floors of the La Salle Hotel:

The American Electric Telephone Company, Chicago, had a comprehensive display of magneto switchboards, telephones, dry batteries and supplies. In charge were L. G. LeBourveau and W. T. Curtis.

The American Electrical Works, Providence, displayed cables, iron and copper wires. Ed Hammond was in charge.

The American Steel and Wire Company, Chicago, showed a complete line of wire, bare and insulated, W. and M. telephone wire, etc. H. F. Durant and G. E. Hill in charge.

The Anderson Electric and Manufacturing Company, Wichita and Chicago, exhibited a party line lockout system. The system is described on another page in this number. G. A. Hege and C. A. Anderson had charge of the exhibit.

The Automatic Electric Company, Chicago, showed its automatic telephone apparatus, demonstrating a one thousand-line system. The Automatic traffic distributer for use in connection with manual boards was also shown. E. A. Mellinger, W. F. Benoist, J. A. Russell, A. A. Burch and J. E. Fisher in attendance

The Automatic Enunciator Company, Chicago, showed a master transmitter and four loud receivers which were used in paging guests at the convention. C. P. Hinckley and F. H. Ijames were in attendance.

The Baird Manufacturing Company, Chicago, exhibited selective ringing systems and pay stations. The Testometer for testing faults was also shown, as well as time stamp. A. D. Baird, Arthur Crane and George Dent were in attendance.

The Baugh Cable Clip Company, Huntsville, Ky., demonstrated the new Baugh cable clip, showing tests of the metal used in making it for resistance to corrosion. D. G. Edwards and B. J. Baugh were in attendance.

The Belden Manufacturing Company, Chicago, showed telephone cords, magnet wire and insulation, enameled wire, steel gains, friction tape, etc. Joseph C. Belden and N. B. Parsons and W. D. Rumsey had charge of the exhibit.

Newell W. Bloss exhibited the Adams-Randall telephone repeater and special transmitter, represented by Albert R. Rogers, Boston, and Professor Randall.

The Will Brown Advertising Company, Minneapolis, displayed three and four color process work for telephone directories. The company specializes on telephone directory advertising of all kinds. Mr. Brown, W. H. Frederick and C. N. Albertson had charge of the exhibit.

Frank B. Cook, Chicago, showed a complete line of pole top terminals, distributing frames, cable terminals, protectors, arresters and construction specialties. J. F. Tompkins, J. M. Moore, I. L. Stodder, F. A. Rader and H. R. Cook attended

The Corwin Telephone Manufacturing Company, Chicago, showed its intercommunicating telephone apparatus, private branch exchange sets and direct current receivers Roscoe Royal and C. C. Newburn were in attendance.

The Cracraft-Leich Electric Company, Genoa, Ill., displayed a line of telephones and switchboards and the new Leich-Automaphone. Messrs. Cracraft and Leich were both at the exhibit.

The C-A-Wood-Preserver Company, St. Louis, exhibited sections of poles treated with preserver, showing the penetration. H. H. Gerhard and J. A. Kenny were in charge of the exhibit. The Valentine-Clark Company, pole dealers in Chicago, furnished the treated samples used in this exhibit.

The Dean Electric Company, Elyria, Ohio, exhibited a line of telephone switchboards, ringers, telephones, etc. In attendance were W. W. Dean, J. G. Mitchell, A. J. Roberts, W. H. Scott, R. Davis, W. J St Onge, W. S. Williams and C. G. Heavens.

The Denio General Electric Company, Rochester, displayed a telephone fire alarm box, operating over automatic telephone circuits. Represented by B. B. Clark.

The Duplex Metals Company showed a comprehensive display of copper-clad wire and product.

The Electric Appliance Company, Chicago, exhibited Cracraft-Leich telephone apparatus, Sandwich pole changers and telephone supplies. R. S. Mitten, H. W. Remington, E. J. Ridenour and J. B. McMullen were in attendance.

The Electric Appraisal and Inspection Company, Cleveland, demonstrated "Pyrene" fire extinguisher. A motor operating submerged in pyrene and electric lights burning in the same medium were shown. Those in charge were M. F. Kane and R. C. Iddings.

The Electric Specialty Manufacturing Company, Cedar Rapids, Iowa, gave an exhibition and demonstration of its wireless cable tester. J. E. Mattison was in charge of the exhibit.

The Electric Storage Battery Company, Philadelphia, exhibited various kinds of storage cells for telephone and other purposes. In charge were G. H. Atkin, P. G. Downton and R. I. Baird.

The Ericsson Manufacturing Company, Buffalo, showed a full line of Ericsson apparatus, steel telephones, handmikes, etc. A feature of the exhibit was the mahogany finish, enameled steel telephone. In charge were Frank Pardee, J. R. Power, Shirley M. Lewis, H. R. Dilks, H. F. Bonney and H. W. Wightman.

The Electro Mechanical Works, Boston, showed an inter-cummunicating system known as the I. B. X. branch exchange system. Mr. Anthony represented the company.

The Holtzer-Cabot Electric Company, Chicago and Brookline, Mass., displayed a full line of exchange signaling apparatus, motor-generators, pole changers, telephone enunciators and intercommunicating apparatus, test sets, charging sets, copper connectors and equipoise, telephone arms. The company was represented by E. R. Harding, C. I. Hickman and G. Montford.

Kellogg Switchboard and Supply Company, Chicago, showed a line of its standard apparatus, private branch exchange equipment, double supervisory equipment and harmonic selector system for magneto ex-

changes. L. D. Kellogg, J. G. Kellogg, J. C. Kelsey, G. A. Joy and others were in attendance.

The Indiana Steel and Wire Company, Muncie, showed a coil of its standard BB telephone wire and conducter tests of galvanizing through the medium of a jar of copper sulphate solution. Robert Miller and H. E. Hartman were in attendance.

The Gradolph Electric Company, East St. Louis, exhibited long distance transmission appliances. William F. Gradolph was in attendance.

W. N. Matthews and Brothers, St Louis, exhibited a full line of the Matthews product. W. N. Matthews, Fred Dewey and Walter E. Bishop were present.

The Miller Anchor Company, Norwalk, Ohio, displayed the anchor which is so well and favorably known to all. G. H. Miller was in charge of the exhibit.

The Monarch Telephone Manufacturing Company, Chicago, showed magneto switchboards, telephone apparatus, four-party apparatus, electric clocks, time stamps, etc. E. E. Yaxley, W. H. Trimm, L. G. Trumble, W. J. Stanton, F. L. MacDonagh and Don C. Gould were in attendance at the exhibit.

The National Carbon Company, Cleveland, showed Columbia dry cells, No. 6 and No. 8 size, for telephone and ignition work. N. C. Cotabish, S. Wilkes and F. N. Plow were in attendance.

The Naugle Pole and Tie Company, Chicago, maintained an office in the hotel during the convention, from which delegates were taken by automobile to the company's pole yard. A. T. Naugle was in attendance.

The Nilson Dillenbeck Company, Chicago, showed a complete line of electric soldering irons. Charles Dillenbeck had charge of the exhibit.

The North Electric Company, Cleveland, had a working exhibit of half of a hundred line unit taken from a ten thousand automanual exchange. The exhibit included operator's equipment, subscribers' instruments, etc. C. H. North, Garrison Babcock, E. D. Smith, George H. Fister and A. L. Hill represented the company.

The Nungesser Electric Battery Company showed a line of its "1900" dry batteries for telephone work. Thomas G. Greer, G. B. Greene, Frank Polzin and W. Jones took care of the exhibit.

The Paragon-Sellers Company, Chicago, showed a line of supplies such as batteries, wire, electrical apparatus, Ironite duplex drop wires, ground cones, electrose receiver shells, etc. R. E. Gilroy, R. E. McDuff and E. E. Dewey were in charge.

The Signalphone Alarm Company, Milwaukee, demonstrated its fire alarm and police signal systems for operation in conjunction with telephones.

The Specialty Device Company, Cincinnati, exhibited the Bierce cable sleeve for making cable joints without wiping joints. S. S. Einstein and Fred M. Bierce were in attendance.

The Standard Underground Cable Company, Pittsburg, exhibited a line of cables and wires, including "Colonial" copper clad wire. J. R. Wiley, W. M. Rogers, B. S. Stewart, A. A. Anderson and others attended.

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, exhibited a full line of telephone switchboards and apparatus, construction material, underground cable, etc.

The Swedish-American Telephone Company, Chicago, exhibited telephones and switchboards, telephone arms, supplies, etc. In charge were E. B. Overshiner and A. V. Overshiner.

The C. M. Taylor Company, Inc., Paris, Ky., exhibited and demonstrated a tree trimmer. Mr. Taylor was in charge.

The Thompson-Levering Company, Philadelphia, exhibited and demonstrated its electrical measuring instruments, testing devices for inductant and capacity, etc. Mr. Thompson was in charge.

The Valentine-Clark Company, Chicago, exhibited treated poles in connection with the exhibit of the C-A-Wood-Preserving Company.

The Vote-Berger Company, La Crosse, Wis., showed its No. 26 magneto telephone, D. T. anchor, pendant telephones, and VZ torch furnace. An improved transmitter was also shown. F. A. Holbrook and E. L. Brown attended.

The Warner Electric Company, Muncie, Ind., showed the Warner pole changer in operation and a new cabinet outfit for same. Special pole changers for private branch exchange ringing were also displayed. R. C. Stone and C. E. Davis had charge of the exhibit.

The Victor Electric Company, Chicago, showed variable speed motors for driving winding machines.

B. F. Wasson, Clinton, Ill., exhibited the Wasson reel and distributed a booklet giving a code of signals for linemen.

The Telechronometer department of the North Electric Company exhibited its central office equipment of time meters and message meters, also subscribers' station equipments and devices

C. I. Stocking, Hiawatha, Kan., exhibited the Hiawatha anchor.

The Butler Electric Company, David City, Neb., had a display of ringing equipment for common battery exchanges. Apparatus for developing alternating, pulsating and four-frequency harmonic currents was shown. A lightning arrester, with a mercury vapor air gap for automatic clearance, was another feature of the exhibit. W. E. Butler and Frank Peschek were in charge of the exhibit.

The Brazil Hollow Brick and Tile Company, Brazil, Ind., exhibited conduit, single and multiple duct. J. P. Brown and F. H. McCree were in attendance.

Matthews at the Convention

Long before the days of scientific advertising Emerson wrote about as follows:

"If a man writes a better book or makes a better mouse trap, though his house be built in the woods, the world will make a beaten path to his door."

To those who know the value of advertising this is no longer true.

W. N. Matthews & Brother, St. Louis, made an early application for an exhibit room at the La Salle Hotel in connection with the International Independent Telephone convention held there during the week of February 6. The rooms were awarded to the applicants by lot, as many were better situated than others. W. N. Matthews & Brother were unlucky and drew a room which was out of the way and which they believed many of the delegates would not visit because of that fact.

The idea then occurred to Claude L. Matthews, who handles the advertising end of this enterprising firm, that a card like that shown here would attract the delegates to their exhibit. That this idea proved its value is shown by the fact that over 200 of the cards were turned in.

On Friday night the drawing was made. The Telafault was won by M. B. Farwell, manager of the Kinloch-Bloomington Telephone Company of Bloomington, Ill.

This card entitles the undersigned Telephone Company to one chance on one Matthews Telafault, the wonderful instrument that finds your telephone cable faults for you. Take this card to room 1848 La Salle Hotel and exchange it for a number. One complete $35.00 Matthews telafault will be given to the company whose officer holds the lucky number that will win the raffle that will take place at 1:30 p. m., February 9, 1911.

W. N. Matthews & Bro.,
St. Louis, U. S. A.

.....
Name of company represented on above line.

.....
City, county and state on this line.

.....
Name and title of officer of company on this line.

The delegates who visited No. 1848 saw a very comprehensive exhibit of Matthews' money saving specialties. The Telafault was shown in actual operation. Matthews' cable clip, a new specialty, was shown for the first time. It was demonstrated that ten of them could be put on cable and messenger while one of any other

Fig. 2.

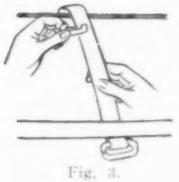


Fig. 3.

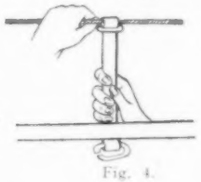


Fig. 4.

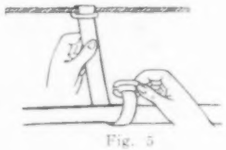


Fig. 5

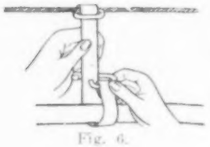


Fig. 6.

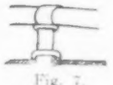


Fig. 7.

kind was being installed, and furthermore, that it gives a positive and separate grip on both cable and messenger. Figures 2, 3, 4, 5, 6 and 7 show how it is used.

The other specialties shown are Matthews' guy anchors, Matthews' 2-bolt guy clamps, Matthews' cable roller, Matthews' cable splicing joint and the Matthews' bridle ring. The exhibit was in charge of W. N. Matthews, the senior partner, Messrs. W. E. Bischoff and Fred Dewey.

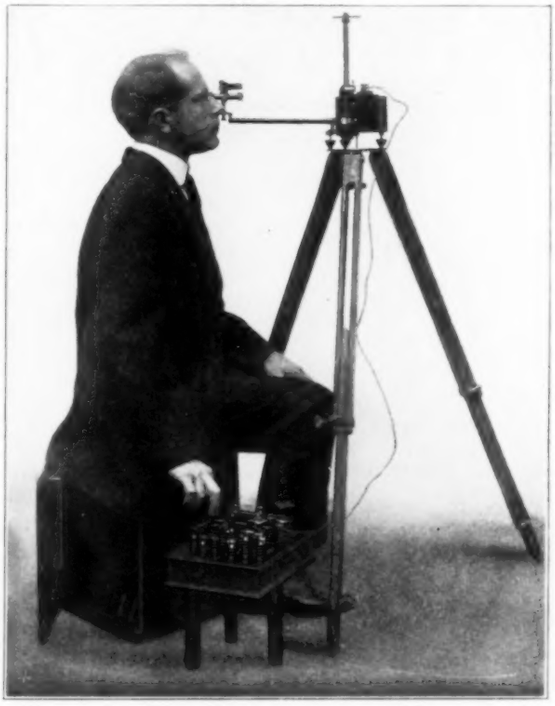
A complaint has been filed with the Interstate Commerce Commission, by the Ohio Independent Telephone Association, against the application of the Act to Regulate Commerce to the telephone companies operating wholly within that state, the contention being that it would work a hardship on the small companies to provide for representation in Washington. There are about 12,000 such companies throughout the United States, and while they connect with toll lines, still they have nothing to do with the making of toll rates.

An Efficient Insulation and Capacity Tester

A new type of insulation and capacity testing set has recently been put on the market by the Thompson-Levering Company, Philadelphia.

This special outfit was designed by, and made for, Luther S. Reasner, of the cable department of the Keystone Telephone Company, Philadelphia, Pa., who worked in connection with Thompson-Levering Company to develop this pieces of apparatus. The instrument has met with universal approval, and has been highly recommended and commented upon by all testing engineers who have had the opportunity of testing and examining it.

The galvanometer is of the highly sensitive d'Arsonval suspension type, with any sensibility up to 1600 megohms and any coil resistance from 30 to 200 ohms. The magnet is of carefully aged and hardened steel, and the instrument is designed to give a deflection proportional to the current throughout the entire scale.



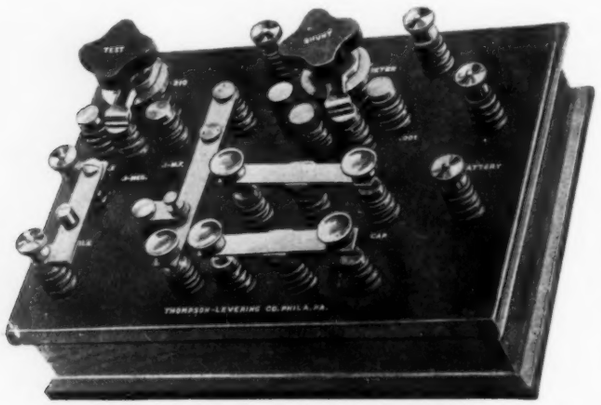
The Testing Set Arranged for Field Use.

The whole galvanometer system is visible through a removable glass window, allowing easy balancing of the coil and replacing the suspensions if required. During transit the coil is clamped, so that it will withstand severe handling, and is so arranged that when it is set up it can be instantly released. The telescope and scale are insulated from the magnet and are supplied with leveling screws. The telescope lens system consists of an acromatic objective lens and acromatic Ransden eye-piece. The objective is corrected for flatness of field and the eye-piece consists of two lenses, acromatic eye and single field, which combination gives the highest results obtainable. The scale, a reproduction of a standard millimeter scale, is well lighted and easily read.

The test box has a standard condenser, a standard resister of 100,000 ohms and an Ayrton shunt, complete

in the one case, thus doing away with separate units, cord connections and master switch. The only leads from the test box are for the galvanometer, cable and battery.

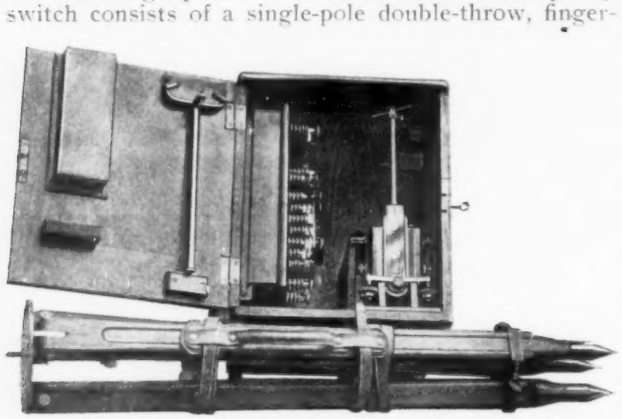
The box is oak with a hard-rubber top and high insulation pillars, upon which are mounted the individual units. It is supplied with removable legs, of round polished rubber, eight inches long. The two



Test Box of the Insulation and Capacity Outfit.

switches are the main test switch, with studs marked "Cable" 0.1 megohm and 0.1 mf, and the shunt switch with the values of 1, 0.1, 0.01, 0.001. The standard 0.1 meghom is wound with manganin wire, and is claimed accurate to within 1-25 of one per cent. The 0.1-mf standard mica condenser is used in place of the old style 0.3-mf condenser. It is easier to use, does not give an excessive kick, and is claimed to be accurate to within ¼ of one per cent. The tyrton shunt coils are wound with manganin wire and accurate to 1-25 of one per cent.

The insulation and capacity key, on the left of the special short-circuit key, is in convenient position to be operated by the index finger This key makes contact on ample silver points and has charge, insulate and discharge points. The insulation and capacity switch consists of a single-pole double-throw, finger-



The Thompson-Levering Insulation and Capacity Testing Set.

type, actuated-rocker switch, with knife-blade spring contacts, and the short-circuit key is constructed so that the right end has a knife-blade contact and the left end a spring contact, made on silver points.

The spring is arranged so that pressing the left side automatically releases the right-end contact and completes the circuit on the left-hand side, giving the tester a permanent short-circuit on the right when desired. When a momentary short-circuit is required the left-hand side can be tapped and the short-circuit tapping of the galvanometer may be made momentarily.

The substantial cable posts have switch attached, so that the cable can be quickly short-circuited across the posts.

The set, in an oak case, is provided with a heavy carrying strap, to be carried in one hand, with the tripod in the other.

Automatic's New Supply Department

There are four "Ms" which determine the quality of any manufactured article; and the fifth "M"—for Modern—is a necessary prefix. These four are Materials, Machinery, Methods and Men.

Material is the base of manufacture. A high grade article cannot be made of second grade stuff. To insure high quality no material has ever been used by the Automatic Electric Company in its manufacture of equipment before it has passed rigid physical and chemical tests. The same O. K. of the laboratories is on every supply article turned out.

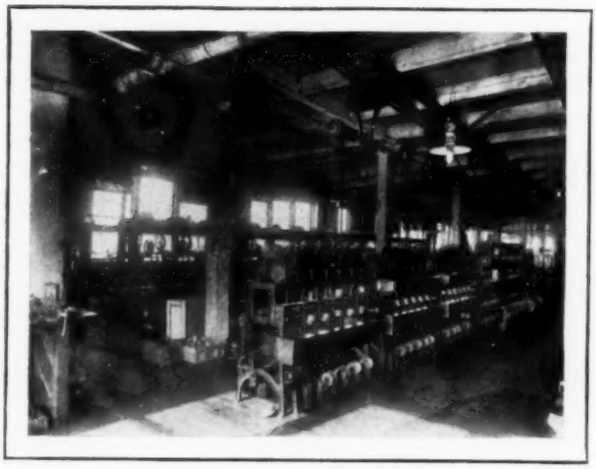
As to machinery—this feature is necessarily modern, because the Automatic supply manufacturing de-

A Corner in the Automatic Electric Company's Shops.

partments are the newest installed in the country. Not only are they equipped with the most modern and up-to-date machines, but they are furnished with original exclusive labor-saving devices.

Closely allied with the advantage of superior machinery is the application of better methods. Time and labor-saving methods, aside from special machinery, have been studied out and applied in every operation, manual and mechanical, throughout the factory. This systematic, scientific procedure makes for better, cleaner and quicker results—all of course having a direct bearing on the final cost of production and selling price.

To take advantage of the high grade machines, methods and material, high grade men have been employed. With its usual thoroughness this company has found and employed the foremost men in the country to supervise the manufacture of its supplies.



Another View in the Automatic Factory.

It is the purpose of the supply department of the Automatic Electric Company to distribute to the independent telephone public telephone accessories which were originally manufactured for its own use only, in an intelligent, satisfactory and economical way.

By virtue of many years of hard experience in an uphill fight and final success in the telephone business the company is able to fully accomplish the ends it guarantees.

Intelligent service—because having actually manufactured, installed and operated telephone exchanges, its engineers are educated thoroughly from the testing of raw material to the finished product in service.

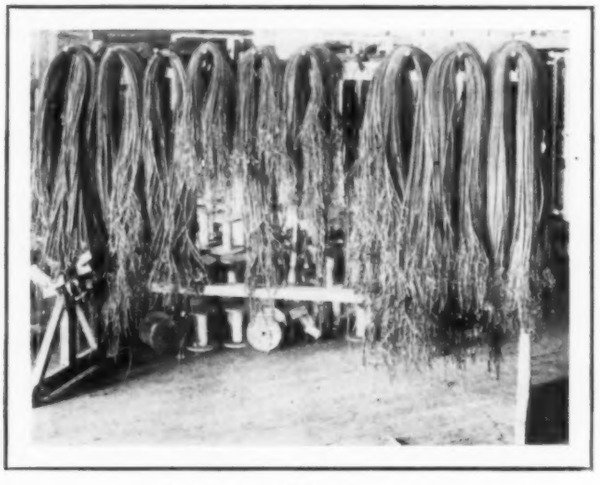
Satisfactory service—because having been a large buyer, it knows what pleases or displeases in the way of uniform quality, immediate shipments, personal interest in the customer's problems, etc. Knowing how much these things means and also how much a pleased customer means, service in all lines has been studied and the best systems for giving satisfaction put into action for the purpose of giving the public better service than it has ever enjoyed.

Economical service—because through experience the company knows how true economy is brought about and its goods are manufactured to give the greatest saving.

It is easy to see how closely these advantages are related to maintenance economy. Perfection of system guarantees against loss and the final product is made at the lowest possible cost. The consumer receives the direct benefit—a reduction in cost means a reduction in price. This is the policy of the company.

Economy means not alone low prices; length of service of an article determines the extent of economy—the actual reduction of expenses.

Maintenance expense is farther reaching than the cost of supplies. The wages of the repair man and the expense connected with him is a much larger item. The less replacement the lower will be the expense. Being better than the average in material and construction, Automatic supplies will last longer.



Cords Manufactured Under New Processes.

Non-Multiple Toll Switchboards

The line of non-multiple toll switchboards offered by the Western Electric Company has been designed to handle conveniently, speedily and economically the toll service in either magneto or central battery exchanges. These switchboards are built in two general types, mainly those having self-restored line signals and those having manually restored line signals. They are made in both single position and double position desk and cabinet patterns in various capacities, and are finished either in birch with mahogany finish or quartered oak, as desired. Simplicity, neatness and convenience are keynotes. Ample space for a calculagraph and sufficient room for the writing of toll tickets is provided.

Western Electric Toll Switchboard No. 1325, with Self-Restored Line Signals.

Three-way keys in the cord circuits provide for the proper monitoring, two way cut-off and two way ringing features which give the highest service and make the toll lines dividend payers. The lines terminate in either the well-known combined jack and signal or the manually restored drops. In the combined jack and signal the spherical target is directly associated with the jack. It is self-restoring and gives a positive signal to the operator, being easily seen from the side as well as the front of the board.

On account of their facilities for connections to

the local board these toll boards have the highest operating efficiency. Features of these boards are: Automatic incoming recording trunks, facilities for connection to plug ended switching trunks, and facilities for switching toll lines to the local board at night, are features. Provision is also made for through toll lines.

Horizontal type keys are used in all these boards, and all keys and jacks are platinum pointed. The well known No. 116 cord weight, double cut-off jacks, the celebrated No. 25-A repeating coil and the Western Electric long-life tinsel cords are details which make for the success of these toll equipments.

This same line of switchboards is also especially adapted for use as magneto exchange switchboards where a desk type board is desired. They are especially attractive in appearance and so conveniently arranged that the operator can attend to other duties as well as take care of the switchboard.

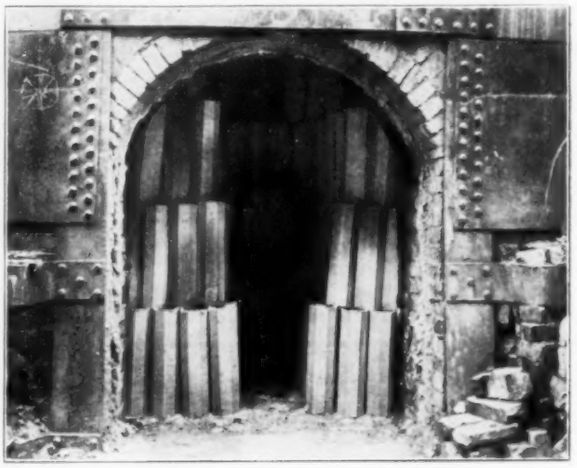
To Reorganize American Automatic

Men interested in the American Automatic Telephone Company, which has been operating a plant in Urbana for the manufacture of automatic telephones and other telephone appliances, have received letters from a stockholders' committee, composed of J. F. Brand, T. E. Dye, Edwin Hagenbuch, B. J. Williams and Michael Siebold, urging a reorganization of the company.

The company is heavily overcapitalized and, as a result, has been in financial difficulties. Under the plan of reorganization, new bonds are to be issued to take up the outstanding bonds and new preferred and common stock will be issued to take the place of the present issues; however, both stocks will be heavily cut down and the new company will be organized on a much more conservative basis. The committee is said to represent over 75 per cent of the outstanding stock.

Where Clay Product is Made

Those who have not observed closely the modern tendency to put all wires underground would find a visit to the plant of a large manufacturer of clay conduit full of surprises. Few of us have the opportunity to make such a visit, and those who have not will doubtless find interest in a description of such a plant and the processes employed. As a basis for preparing such a description we find an excellent example in the plant of the Clay Product Company, at Brazil, Indiana. It is situated one mile south of town on a level tract of land covering forty acres, and the company has near by a hundred and forty acres more of land which is underlaid with a fine fire clay of a kind exactly suitable for making the high grade of conduit for which the company is noted. Thus an advantage is gained at the outset by not having to make an artificial mixture of clay. The company's principal buildings are a three-story main building, an office building, a three-story dryer, blacksmith and carpenter shop, storehouse, barn, garage, boarding house and superintendent's house. Some of these buildings are built entirely of hollow block and cull conduit. The clay is ground in nine-foot dry pans. It is then elevated to three-sixteenth-inch mesh screens, from which a bucket elevator conveys the clay to two pug mills, serving two



Conduit Vitrified in the Kiln.

machines. The factory power plant consists of a two hundred and fifty horse power engine and two one hundred and fifty horse power boilers. In the kiln

Triangle Three-Way Conduit Laid by the Norfolk, Neb., Long Distance Telephone Company.

battery are found twelve 32-foot down draft kilns, with eight open grates in each. This comprises the mechanical equipment of the plant.

Panoramic View of the Clay Products Company.

The Clay Product Company entered the conduit business with a full knowledge of the electrical requirements. The workmen engaged in the process are all experienced in that particular line. All the clay used is tested scientifically and the use of definite fomulas and the fact that the stills are equipped with recording pyrometers insures a uniformly excellent product. The illustrations on this page show various steps in the process of manufacture from the excavation at the clay mines to loading the conduit in box cars. Since its inception the company has brought out numerous new forms of conduit, aiming to meet special needs of the users. These special forms have met with uniform approval.

From the Clay Mine.

In telephone and telegraph work the long, four and six-multiple conduit is most commonly used. It has the advantage of economy and simplicity in construction and ease in installing the cables.

All conduits must be thoroughly vitrified to resist the actions of erosion and corrosion, and must be glazed on the inside so as to offer very little friction to the cable when it is pulled through. The glaze is really not needed on the outside of the conduit.

Loading the Finished Product.

The company produces a great deal of single conduit. This is used mostly for high service trunk lines for the transmission of power and lighting, and is not very economical for telephone work or lines which do not require high insulation.

An interesting feature of the work at the Clay Product's plant is the testing by an expert before the conduit is allowed to leave the yard. The tester is so thoroughly familiar with the product that the tap of a hammer or the scratch of a knife reveals to him the slightest imperfection in the conduit.

As is well known, the matter of supplying conduit is often largely one of location of the plant and consequent freight rates. The Clay Product Company recently closed a contract with the Western Electric Company to furnish all the conduit used this year by the Bell telephone licensee companies west of Pennsylvania north of the Ohio river, and west of the Mississippi south of the Ohio river.

Credit for the success of the Clay Product Company is due the present officers, H. H. Titsworth, president; F. W. Darling, vice-president, and C. F. Shannon, secretary. The company's Chicago office is in the Stock Exchange building.

Night Operators Satisfied

A resolution of the New York State Consumers' League, asking for a thorough investigation into conditions that surround telephone girls who work at night, and proposing that no girls under twenty-one be employed at night, has not found favor with the girls themselves. Some of them see in this an effort to replace them with men at night, as has been done in some places.

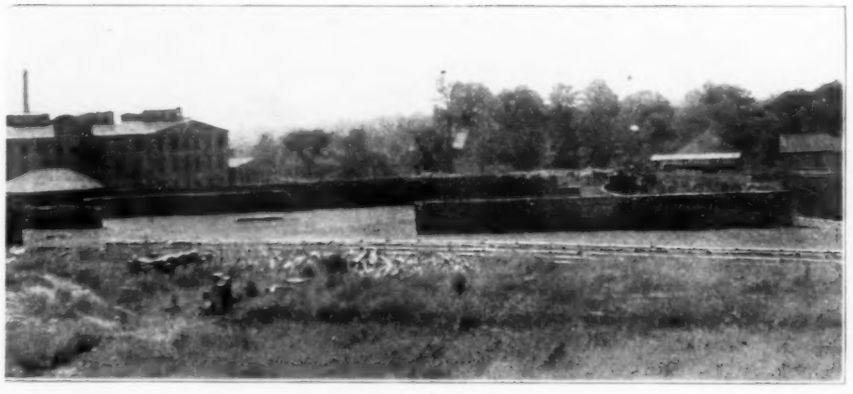
"I'd rather work nights than days," said Miss Edith McKinley, a night operator in a New York exchange. "Besides, it is much safer going home in the daylight than it is in the evening, when the streets are full of mashers and rowdies.

"Why not bar the girls out of night work in the restaurants and in the elevated ticket offices in Brooklyn and in other places? Never mind the back talk a few rude men send in over the wire. It is easier to have them call you 'dearie' over the telephone than to your face. Suppose they put men on at night I think the women would try to flirt with them.

"Working a telephone switchboard takes patience—more patience than men have. Why, men would be giving people a battle over the telephone all the time instead of saying, 'Number, please?' or, 'I'm trying,' after the party has lost patience because some one near the telephone they want hasn't answered it.

"We girls have an organization, and right now we are deciding what is the best step to take to offset this agitation against our working nights. The telephone girls are well satisfied, and the company is with us."

"There is no intention of displacing girls at night," says a telephone company official. "Our girls are all carefully selected. They are a bright, intelligent, trained army of workers, in whose welfare the company is deeply interested. They are in no danger of being displaced."



Plant Located About a Mile South of Brazil, Ind.

Installing the Conduit.

Improved Party Line Service

There is perhaps no part of a telephone system that affords a greater opportunity for improvement than the party line service. In view of this fact and the frequent party line troubles, telephone men will be glad to learn more about the selective ringing and lock-out system manufactured by the Anderson Electric & Manufacturing Company, Chicago.

This system, which is the result of many years of development work, consists of a substation device and a central office selector or calling device. The earnest efforts of the company have been confined to the perfection of the lock-out system within the range of large central energy systems, and therefore at the disposal of practically all the different kinds of telephone systems in use today. This has been done by the use of a motor driven selector, which is the acme of automatic selecting devices, because of its rapid and accurate operation.

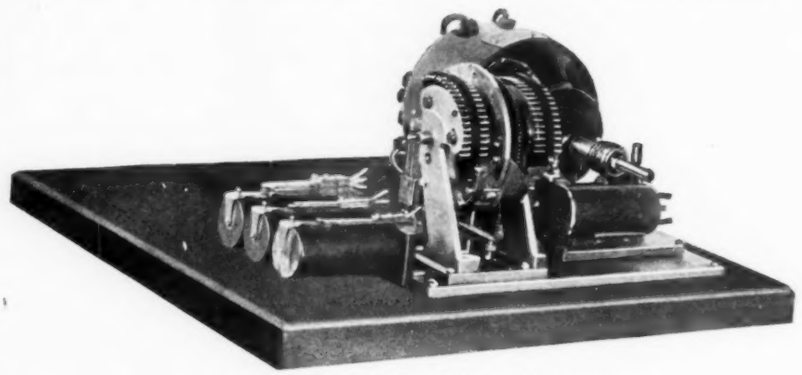
Briefly speaking, the selector consists of two parts—the selector proper and the number buttons. The selector proper is arranged to be situated in the wire chief's room or any desirable place away from the switchboard, while the number buttons can be mounted convenient to the operator and are connected to the selector by means of a cable. These buttons when in position on the keyboard reminds one of a bank of order wire keys, though occupying a slightly larger space. The "touch" of the plungers on the key is very agreeable and adaptable to satisfactory results. It also carries a very desirable new feature in the way of a magnetic coil that may be readily removed without disturbing the wiring of the key. It has a capacity of 20 stations for any party line. In general one is

The Selective Device.

One of the Stations.

required for each operator equipped with lock-out lines, but it would be possible to arrange for the use of one between each two operators. This new magnetic key takes a prominent part in the working of this new departure in dispensing lock-out service.

Perhaps the most satisfactory way to bring out the merits of these new devices would be to follow a call through. In order to make a call, the operator plugs into the ringing or calling jack in the usual way, presses the button or buttons corresponding to the parties desired on the lock-out line, and pulls the ringing lever associated with the particular pair of cords that are being used. The pressing of the button on the magnetic key cuts off the regular ringing current and completes the circuit for each particular party through the proper contacts on the machine selector. The pulling of the ringing key lever instantly operates the starting relay on the selector. The operation of this relay causes the motor to start and completes the circuit through an electromagnet which operates a



The Motor-Driven Selecting Mechanism.

friction clutch on the selector.

This friction clutch remains in contact only long enough to bring the selector to the proper contact. When the selector reaches the particular contact that controls the substation calling attachment of the subscriber desired, it has fulfilled its function and is instantly cut off and returned to the normal position. This is accomplished by means of a releasing relay, the operation of which is positively predetermined when the proper magnetic key for the party desired is pressed at the start of a coil. As soon as the releasing relay operates, the motor which operates the selector stops instantly. It may, however, be operated continuously if desired in exchanges where it would be economical to run the motor continuously. Or it may be operated momentarily during the idle hours and continuously during the busy hours. The operator holds the ringing key lever until the magnetic button is released by the selection which indicated that the station is being signaled, and this ring can be governed by the length of time the lever is held closed after the button becomes released. To ring back on the line it is only necessary to ring as in any other case, as the stations called are the only ones connected.

In exchanges where it is desirable a lamp can be placed directly above each lock-out line, which, when covered with a red lamp cap, corresponds with the busy signals along the line. This lamp is lighted by a line relay which is actuated whenever a call goes over the line and gives the operator complete supervision over her lock-out lines. As soon as the operator restores the line this red light goes out and all the parties on that line are once more at liberty to make calls. In restoring the line to normal condition the operator simply presses the releasing button on the magnetic key and then gives the ringing key lever a slight pull. Here we have another new and important feature, and that is, complete operators' supervision over the lock-out line, since the red lamp stays lighted

while the line is in use and remains lighted until the operator restores the line. Heretofore it has been necessary for the central operator to watch her lines closely in order to ascertain when they were released. This new feature, then, really places the lock-out line on a par with the private line in so far as the operator and her work are concerned.

The substation device can be attached to any standard telephone in a few moments time, and the only thing necessary to change any line from public to private service is the addition to each party's telephone on a particular line of a lock-out attachment as illustrated in Fig. 1. To connect this attachment the three wires are disconnected from the top of any standard bridging telephone and connected to the top of the attachment instead, then four wires protruding from the bottom of the attachment are connected to the telephone and that particular station is ready for secret service.

The attachment illustrated consists of a polarized relay, the armature of which actuates a small ratchet wheel which may be set so that a certain number of impulses sent over the line will cut in that particular station. The details of design and construction make it absolutely impossible to cut in a substation on any other than the correct number of impulses. The mechanism of the attachment is shown in Fig. 2.

In order to make the action of the lock-out accurate, positive and rapid, it became necessary to overcome the residual magnetism of the polarized relay, and this was accomplished by using alternate impulses of positive and negative current. The positive impulse from the main battery causes the ratchet wheel to operate and the negative impulse from the low-voltage batteries is just sufficient to neutralize the effect of the positive impulse on the saturation of the relay magnet.

When the correct number of impulses to cut in a particular station are sent over the line, the circuit connections are completed, so that the locking relay shown at the bottom of Fig. 2 is actuated to cut in that particular station and keep it there until the conversation is finished and the line cleared by the central operator. From the above we may conclude that the central operator does three things in making a call over a party line lock-out circuit, namely: Locks out all the parties on that line; selects and cuts in the desired party, or parties; and rings the desired party or parties, simultaneously. It is obvious, therefore, that each party is called with a single ring, and that the use of code ringing is eliminated.

Moisture-Proof Cords for Railway Telephones

The Western Electric Company has recently developed a new line of telephone cords designed especially to meet the severe conditions common to railroad work. After a thorough test in the company's laboratory a number of these cords were placed in actual service in order to insure their meeting the necessary service conditions. These tests proved satisfactory and the cords are now giving excellent service.

The construction of these new cords is different from that of the standard cords now in use, the most radical change being that the insulation of each conductor is treated with a moisture-proof compound and that each conductor, in those cords which are subjected to the greatest wear, is reinforced with copper wires.

For example, each of the two conductors in the No. 408 receiver cord consists of a number of strands of the best tinsel reinforced with six strands of copper wire. The conductors are made up with an improved twist, and with the copper wires a great amount of strength is added to the cord. Each conductor is wrapped with a covering of wool, which has been saturated with a water-proof asphaltum solution. Over this is placed the conductor braid of mercerized cotton, and the entire cord is then enclosed in a special external braid of a high grade of mercerized cotton.

This construction insures a flexible, moisture-proof cord, with long life and increased strength throughout. These cords are made in standard lengths, consisting of one, two, three and four conductors for use as receiver, transmitter and extension cords in connection with the various types of desk stands, transmitter arms and flexiphones.

An Expansion Earth Auger

The most prominent feature of the Standard earth auger, as manufactured by the Standard Earth Auger Company, Chicago, is an expansion blade, similar in principle to the expansion bits so familiar to carpenters. This device is quite clearly shown in the accompanying illustrations. These also show the Standard's telescopic stem—another valuable feature which allows the auger to be maintained at a convenient height in boring pole holes.

The Standard Earth Auger.

The Standard No. 10 will bore nine different sized holes, from eight to sixteen inches in diameter, and is changed from one size to the other very easily.

Other features of the instrument are its facility in handling either hard earth or dry sand, its freedom

from binding in the hole and the readiness with which it discharges its contents. The company's guarantee is very broad.

The company is furnishing as a souvenir a very neat little watch fob of leather and metal, carrying its trade mark.

Cable Trouble Testing

In developing its "wireless" cable tester the Electric Specialty Manufacturing Company learned that if the faulty circuit happened to open up while testing, the tone did not stop, but could still be heard, nearly to the end of the cable. This is frequently due to the capacity of the conductors and at times has proven very discouraging to users of this method of testing. In making experimental tests the company took two wires (Fig. 1) and connected condensers of small capacity across the circuit at regular intervals. This gave a condition similar to that of a cable. By connecting the vibrator at (a) a tone could be traced along the circuit past several of the condensers before the ear could detect any difference in the tone; by the time the last condenser was reached the tone was very weak, and after passing it the tone was lost entirely.

The next test (Fig. 2) was to connect a resistance coil across the circuit between the vibrator and the first condenser. This coil was about 1,000 ohms resistance, the idea being to get a condition about the same as that of a usual case of wet cable. Theoretically, in this method of testing, the tone should be picked up anywhere from the vibrator to the coil (the wet spot in the cable), but owing to the resistance considerable of the current went beyond the coil to the condensers, in fact, it was quite difficult to detect any difference until several condensers had been passed, the tone gradually dying out as the end was approached.

Another test, in which the coil was connected at the opposite end of the circuit between the last two condensers, gave a perfect test. With the coil across the circuit at a point about half way, the tone could be distinctly heard anywhere from the vibrator to the coil, but a decided change was noticeable after passing the coil, the tone then gradually dying out to the last condenser.

From these tests it was learned that certain troubles could best be located by connecting the vibrator from the outer terminal of the cable and others by the change of tone after passing the fault.

The most difficult trouble to locate is where water gets in a sleeve or pot head, as the cable at such places is wrapped with muslin, after which hot paraffine is poured on which makes a covering through which water is very slow to penetrate. Frequently the sleeve may be partially filled with water and only a few pairs show any trouble whatever. These pairs usually show a high resistance to begin with, which increases greatly after the testing current has been on a short time.

The only way to make a successful test on such faults is to make the test very quickly. It is sometimes necessary for the trouble man to call in and have the vibrator started just long enough to get a test at a certain point and then have it stopped until he is ready for the next one. If the cable is wet enough so that the resistance does not exceed a few hundred ohms there should be no difficulty whatever in locating the trouble, although it will always be found easier to locate faults where marlin hangers are used than if the metal hangers are used.

Solid grounds and crosses are never difficult to locate; shortened pairs are somewhat harder, but it is always possible to locate them if care is used. The company claims that at least ninety per cent of all cable troubles, including opens, can be located by its method of testing.

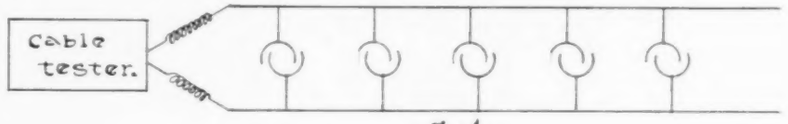


Fig. 1

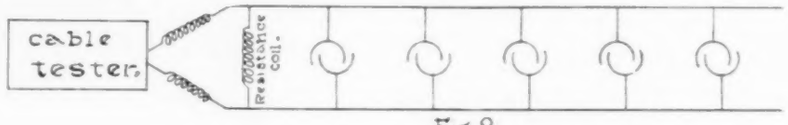


Fig. 2

Artificial Cables Used in Developing the Wireless Cable Tester.

Bill for Nickel Rate, New York to Brooklyn

Assemblyman Turley of New York has introduced a bill that if enacted will compel the New York Telephone Company to reduce its rate between Manhattan and Brooklyn from ten cents to five. Five cents is fixed as the rate which the company may charge for communications of not more than five minutes' duration between any two points in the greater city.

The bill further provides for a rebate to all subscribers where the fixed charge for a specified time exceeds the sum actually earned by the company at the rate of five cents for each call of five minutes.

The provision is as follows:

Whenever any such person, corporation or joint stock association installs a telephone with a subscriber, in such city, for a fixed charge for a specified time, the subscriber shall, upon a renewal of said service at the expiration of such time, be entitled to a credit, upon the charge for the renewal period, of a sum, if any there be, equal to the excess of such previous fixed charges above the actual sum earned during the contract period, at the prevailing legal rate for individual calls, and any agreement in violation of this requirement shall be void. But nothing herein contained shall be construed to entitle a telephone subscriber to a cash rebate in the event that he fails to renew such service at the close of any such contract period.

An Ericsson Valentine

Around about February 14 the Ericsson Manufacturing Company sent out to its friends a real for-sure valentine, covered with large, red hearts. When opened, this dainty piece of advertising reveals "The Two of Hearts" as two fair damsels busy with the Handmike and the steel telephone.

The following, printed on the outside, strengthens our suspicion that there is some poet on Military road:

The way to reach the heart of man
Is through his stomach, so 'tis said,
But we to loftier heights aspire,
And strive to reach him through his head

Our proposition's simply this:
(Today proposals are right in line),
If anxious to increase your "biz"
Just take us for your valentine.

Something New in Toggle Bolts

The Diamond Expansion Bolt Company has brought out a toggle bolt that has a number of distinctly new features. The illustrations give a very clear idea of the working of this new device.

The new bolts are made with pressed heads in one piece, no rivets. An ordinary stove bolt nut is inserted

The New Diamond Toggle Bolt.

in the slot as shown, and when the bolt is inserted is locked into the toggle head.

This type of toggle bolt is recommended for its great strength, the nut of the stove bolt having direct bearing on both sides of the head against the surface of the hollow wall to which it is attached. It will sus-

The Diamond Toggle Bolt in Place.

tain the same amount of weight as a stove bolt bolted through the wall.

Diamond toggle bolts are so designed that as soon as the bolt is turned the job is finished, no cutting off of threaded ends being necessary. The process of using is to remove the nut from the bolt and insert the

The Frame of the Bolt.

nut diagonally through the slot in the toggle head, across the channel; then to insert the bolt a few threads into the nut, through the open end of the channel; then to turn the channel back, over the bolt, and insert in the hole.

The company is making interesting prices on the new product.

Lindsley Brothers Company, producer of western cedar poles and red fir cross arms, with headquarters at Spokane, Wash., has moved its eastern office from the Monadnock to the Fisher building, Chicago.

New Building for Monarch Electric and Wire

The accompanying illustration gives a good idea of the splendid new home of the Monarch Electric and Wire Company at the northeast corner of Adams and Desplaines streets, Chicago. The building, as the cut

New Factory Building of the Monarch Electric and Wire Company.

shows, has six stories and a basement. It is entirely devoted to the warehousing of the company's extensive supply business.

C-A-Wood-Preserver Company in St. Louis

The C-A-Wood-Preserver Company has moved its headquarters from Austin, Texas, to St. Louis, Mo., its general offices in that city being located in the Wright building.

The company now has sales offices at 275 La Salle street, Chicago; 135 Broadway, New York; Littlefield building, Austin, Texas; 863 Camp street, New Orleans; Felt building, St. Paul, and the Western Electric Company, Seattle, Portland, Los Angeles and San Francisco.

The Naugle Pole and Tie Company, Chicago, has just published a little green book giving the Northwestern Cedarmen's Association specifications for telephone poles. Every telephone company should have a copy. The company will send one if you ask.

An interesting booklet and a number of circulars are being sent out by the Stromberg-Carlson Telephone Manufacturing Company describing its line of "Inter-Comm-Phones" for all classes of intercommunicating work.

Every death and every birth in a small town causes approximately 300 extra telephone calls, according to figures issued in Columbia, Mo., by the telephone company.

The Paragon Sellers Company, Chicago, is sending out to the trade something new in blotters. Drop a line and get one.

Brevities of the Business

PERSONAL NOTES.

Among TELEPHONE ENGINEER'S distinguished visitors during the past month were Messrs. K. Ishikawa and Y. Nishiwaki of the Department of Communications, Japan, at present connected with the consulate of Japan at New York City.

Frank J. Clarke, equipment engineer for the Southern Bell Telephone & Telegraph Company, has resigned to accept a position in the southern division of the American Telephone & Telegraph Company, with headquarters at Atlanta.

R. H. Davis has been appointed manager of the Southern Bell Telephone Company's exchange at Lumberton, N. C.

E. M. Haldeman, for some years assistant auditor of the Iowa Telephone Company, at Des Moines, has been promoted to the position of auditor of the company, succeeding E. Palm, who becomes auditor of the Bell Telephone Company, of Canada.

W. A. Pixley, of Omaha, who has been with the Bell Telephone Company for a number of years, has been promoted to the position of general auditor for the Nebraska Telephone Company, the Iowa Telephone Company and the Northwestern Telephone Exchange Company, the latter including all of the offices in Minnesota, North Dakota and South Dakota. Mr. Pixley will be succeeded as auditor of the Nebraska company by E. B. Scannell.

At the annual meeting of the stockholders of the Rochester Telephone Company, G. R. Fuller was re-elected president of the company.

On account of ill-health Theodore Thorward, one of the principal organizers of the Home Telephone Company of South Bend, and to whose labors the success of the company has been largely due, has resigned his position as president. Mr. Thorward still retains his interest in the company, and is a member of the board of directors and of the executive committee. Sanford H. Harris, of Chicago, one of the heaviest stockholders in the company, has been chosen as his successor, and Elmer E. Daicy, Austin, Texas, has been appointed general manager. H. A. Harris was elected treasurer to fill the vacancy caused by the resignation of S. M. Harris, who resigned to accept the presidency.

Waldo G. Palmer, chief inspector for the Bell Telephone Company at Youngstown, has been promoted to the position of plant superintendent of the fourth district of Ohio, with headquarters at Toledo. The position is a new one just created by the company. Under the new system the state is divided into four districts, with a plant superintendent for each.

I. J. Lane, of Lincoln, Neb., has been appointed district manager of the Nebraska Telephone Company, with headquarters at Fremont.

W. W. Nicholson, division manager of the New York Telephone Company, with headquarters at Syracuse, recently celebrated his thirty-fifth year in the service of the company, at which time he was tendered a reception by the officials of the company in his territory.

E. W. Kearns, of the Monarch Electric and Wire Company, is a candidate for alderman of the Seventh ward, Chicago. Among the things advocated by Mr. Kearns are reduction of gas and electricity; the deadening of noise on elevated roads, and the running of more cars, five-cent fare on the Illinois Central Railway, the abatement of the smoke nuisance, the construction of its own water system by South Park, Fifty-fifth street extension of street cars.

M. S. Allen, who has been in charge of the telephone sales department of the Western Electric Company's Atlanta house for three years, has been appointed manager of the Omaha house of the same company. Mr. Allen was connected with the Rocky Mountain Bell Telephone Company for ten years, entering the employ of the Western Electric Company as manager of its Salt Lake City house in 1905. A year later he became manager of the San Francisco house, from which he was transferred to Atlanta in 1908. While in the South Mr. Allen has been closely identified with the enormous spread of the rural telephone movement in that section.

At the annual meeting of the Chicago Telephone Company John M. Clark, who for a number of years was president of the company and later chairman of the board of directors, retired from the position of director and was succeeded by Angus S. Hibbard, general manager of the company. The board as it now stands is as follows: Arthur D. Wheeler, chairman; Chauncey Keep, D. Mark Cummings, Angus S. Hibbard, Robert T. Lincoln, William H. Miner, Theodore W. Robinson, Byron L. Smith, Albert A. Sprague, Bernard E. Sunny, Theodore N. Vail.

CONVENTIONS.

The West Virginia Independent Telephone Association will hold its fifth annual convention at Clarksburg, W. Va., March 23 and 24, 1911, with headquarters at the Waldo Hotel. Manufacturers are urged to secure hotel accommodations early owing to the fact that one of Clarksburg's largest hotels was recently destroyed by fire. The main social factor of the convention will be the smoker which will be given on the evening of the 23d.

NEW TELEPHONE COMPANIES.

LITTLE ROCK, ARK.—Articles of incorporation have been filed with County Clerk Henry O. Vogler for the Arch Street Telephone Company. The officers of the company are R. S. Parker, president; Daniel Rauch, vice-president; L. H. Kirby, secretary, and Edwin Watters, treasurer. The system will have direct connection with the southwestern lines in Little Rock and vicinity.

SMITHVILLE, ARK.—The organization of the Farmers' Mutual Telephone Company at Smithville, has been completed, with the following officers: President, N. L. Dunahue; vice-president, J. R. Barnett; secretary, Henry Black; treasurer, Charles Bratcher. The company will construct lines to Imboden, Black Rock and other points.

GAINESVILLE, GA.—The Gainesville and Oakwood Telephone Company has applied for a charter. Among those interested are the following: G. T. Cook, J. N. Wallis, T. A. Moore, H. W. Glazer, M. J. Williams, N. M. Kennimore, W. F. Scroggs, T. W. McDonald, J. J. Reed, L. I. Hughes, Scott Moore, W. T. Roberts, A. M. Moore and J. H. Wallace.

GAY, GA.—C. D. Freeman, of Griffin; J. R. Gay, Roy Crouch, S. R. Williams and W. A. Estes, of Gay, and W. P. Ellis, of Oakland, who have filed application for a charter for the Gay Telephone & Telegraph Company.

GRAYMONT, ILL.—The Home Creek Telephone Company has been incorporated with a capital stock of $1,500 by Leonard I. Harris, Lewis Buland and Thomas Askew.

CULLOM, ILL.—The Cullom Mutual Telephone Company has been incorporated with a capital stock of $2,500. The incorporators are Daniel Gale, Martin Detwiler and Fred W. Kingdon. Mr. Kingdon is president of the company.

ALBANY, ILL.—Articles of incorporation have been filed for the Albany Telephone Company; capital stock, $8,000; incorporators S. B. Dimond, Herbert J. Simpson, T. H. Adams.

POLAND, IND.—The Poland Telephone Company has been incorporated by W. W. Huber, F. W. Huckriede, L. D. Tressel, Dennis Anderson and J. F. Kohlenberg.

BRISTOW, IOWA—The West Point Telephone Company has been incorporated with the following officers: President, J. W. Piper; treasurer, J. H. Richardson; secretary, J. C. Joungkunz; capital stock, $20,000.

COIN, IOWA—The Buck Creek Mutual Telephone Company has filed articles of incorporation with the secretary of state. The capital stock is $5,000, and the incorporators are H. M. Meyers, Frank Annan, H. D. Ellis, W. L. Annan, Herman Seifering, Henry Muller and J. H. Meyers.

TRAER, IOWA—A new telephone company will be organized with a capital stock of $60,000 for the purpose of taking over the Mutual Telephone Company operating exchanges in Traer, Reinbeck and Gladbrook.

OSBORNE, KAN.—The Osborne-Cheyenne Telephone Company has been granted a franchise by the city council.

CLARKSON, KY.—The Walnut Hills Telephone Company has been incorporated with a capital stock of $210. The incorporators are T. C. Witten, J. H. Bratcher, W. D. Witten and others.

ASHEVILLE, KY.—The Citizens' Telephone Company has been incorporated with capital stock of $3,000, and the following officers: President, Rev. E. W. Miller; vice-president, Ed Miller; secretary, J. C. Hawes; treasurer, J. C. Bruce.

EVARTS, KY.—The Martin's Fork Telephone Company has been incorporated by Charles Haynes and others with a capital stock of $2,000.

BINGHAM LAKE, MINN.—The Bingham Lake Telephone Company has been incorporated by John H. Henderson, V. E. Rogers and Wm. H. Dummett, Jr., with a capital stock of $2,000.